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TOWARDS A CONCEPTUAL FRAMEWORK FOR THE CONTINUUM OF CLINICAL COMPETENCE DEVELOPMENT IN AN UNDERGRADUATE OSTEOPATHIC MEDICAL EDUCATION PROGRAM:

An Exploratory Study

By

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ABSTRACT

TOWARDS A CONCEPTUAL FRAMEWORK FOR THE CONTINUUM OF CLINICAL COMPETENCE IN AN UNDERGRADUATE OSTEOPATHIC MEDICAL EDUCATION PROGRAM: An Exploratory Study

By

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This study is an interpretation of interview data on clinical competence development. The interview data were acquired in the context of a cross-sectional study of the training of physicians at the Michigan State University College of Osteopathic Medicine. Students at three levels of training were asked to describe in detail what they were able to do in the clinical setting and why.

The responses to these questions were analyzed towards answering two basic questions: (1) can unique definitions of competence be developed for each of the three levels of training? (2) what variables in the instruction/learning process should be considered when developing a competence-based medical education program?

Students described doing specific clinical tasks, medical history and physical examination and medical problem solving, in ways that were unique to a given level of training. Not only what and how they did the task, but the perspective from which they viewed the task, differed for each level of training. From these descriptions were drawn four (4) continuums of competence which could provide the basis for defining clinical competence at each level of training: philosophic perspective; four aspects of cognitive development; four aspects of psychomotor development; and three aspects of attitudinal orientation.

From students' explanations for why they could or could not do certain tasks were drawn six variables in the clinical competence developmental process: student's accumulated knowledge and skills; clarity of program goals and philosophy; congruity of curriculum and instruction; integration of theory and practice; instruction/role modeling; and the context of learning.

Recommendations for further research were presented and implications of the findings for administrators of osteopathic medical education programs were discussed.

DEDICATION

To Paul, Calien and Wynne

Whose joy in the hard work
and satisfaction of learning,
modeled the continuum.

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Student researchers depend on the guidance, support and forbearance of many - mentors, peers, family and friends - to get them through their first modest effort in scholarship. Novice researchers can hardly lay claim to full credit for whatever product emerges from their efforts. Such is my case. It is impossible to properly acknowledge the many people who contributed to this dissertation. However, it would be remiss to not publicly thank a few to whom I am especially indebted for having helped make the study possible and, I hope, useful.

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Introduction

Michigan State University College of Osteopathic Medicine (MSU-COM) was the first college within the profession to be publicly supported and to become part of a public university.[1] As part of its committment to furthering osteopathic medical education, the College, in 1974, initiated a study of its professional training program, the first of its kind within the profession, under the guidance of Paul L. Dressel, Ph.D. The study started from the premise

> that a professional training program should be evaluated by examining total outcomes or competencies. Instead of asking what courses a student in a professional program ought to take or what knowledge is essential, this approach concentrates on those who have almost completed their training, identifying what they think and feel about their program and profession. (Sharma and Dressel 1975, p. 2)

A series of studies have been undertaken as part of this on-going effort to carefully examine the MSUCOM curriculum and its relation to student professional development. The studies have variously described the values and concerns of interns and externs (Sharma 1975, 1976), program evaluation by students (J. Dressel 1977; Weaver 1980), predictions of academic achievement (West 1979), issues in examining and grading (P. Dressel 1979), attitudes and values in osteopathic medical education (Greenman and P. Dressel 1980), and curriculum analysis (P. Dressel 1981). Each of the studies has contributed to a further understanding of the educational process in which MSUCOM students are engaged. These insights have been shared with other colleges of osteopathic medicine and the profession through the publication of <u>Occasional Papers</u>, and some have provided the basis for presentations at national conferences on osteopathic medical education.

1 Public legislation passed in 1969 transferred the Michigan College of Osteopathic Medicine, chartered in 1964 at Pontiac, Michigan, to Michigan State University in 1971.

This study is an extension of the larger, longitudinal study of the MSU-COM curriculum and its students. It focuses specifically on the variables attending the cumulative process of developing professional competencies. As in past studies, students' perceptions provide the basis for the descriptive study. In contrast to previous studies, which considered students' perceptions of the external processes of their education (courses, teaching, grading, curriculum structure), the present study focuses on the internal processes of the students (the specific things that students know and are able to do in the clinical setting at each of the three major stages of the curriculum), and the relation of these internal processes to the external processes of the program. The study addresses the broad question: How do students accumulate and integrate the knowledge, skills and attitudes necessary to performing the role of an osteopathic physician?

While the study is a case study, concerning itself with a single educational program, its relevance to the remaining 14 colleges of osteopathic medicine is presumed. As the social demands for accountable and efficient educational systems become increasingly persistent, osteopathic medical educators must ask themselves the critical question: How can we be certain that we are producing physicians who competently practice according to the tenants of the profession? The current study is an important first step towards answering that question.

Chapter 1

THE PROBLEM

American higher education, including professional education, is now under more critical public scrutiny than perhaps at any time in its history (Riesman 1979). The professions have in the past enjoyed a considerable degree of autonomy in managing the means by which individuals enter and maintain their rank status, because society has assumed that exposure to a formal educational program results in the graduate developing the necessary professional skills and virtures. While the credentialing process has typically required graduates to demonstrate their knowledge of the curriculum content, it usually has not required their demonstrating ability to perform actual professional tasks. That is, the professional school currriculum was assumed to be relevant to competent practice (Olesen 1979; Olmstead undated). That assumption is now being challenged.

Traditional Curriculum Design and Evaluation

Medical education has been said to have evolved in three stages: the dogmatic era, the empiric era, and the scientific era (Flexner, 1910). Since the nearly universal implementation of the "Flexnerian Scientific" curriculum model, medical educators have continuously modified the curriculum content to accommodate new scientific and social demands. It has been expected that graduates will be knowledgeable of the latest and most advanced techniques for managing disease, if not proficient in their use (Armstrong 1977). This expectation is coupled with the belief that a thorough foundation in the basic and medical sciences is a fundamental prerequisite to such knowledge (McGaghie 1978).

The study of disciplines; i.e.; cognitive knowledge, has been the focus of the traditional Flexnerian curriculum. Even the clinical experience, which follows the didactic years in this model, remains focused on the cognitive aspects of the clinical discipline and specific, often uncommon, disease.

That is, medical school curricula have traditionally been designed to include the knowledge thought to be critical to the physician's professional performance. Recent modifications have expanded the curriculum to include new areas of knowledge in response to medical students' and patients' demands that the application of scientific and medical knowledge be tempered with knowledge of ethics, sociology, anthropology, psychology and epidemiology (Cope 1968; Krevans and Condliffe 1970; Jesse 1971; Shapiro and Lowenstein 1979).

It has become apparent in recent years that the traditional goal in medical education of gaining encyclopedic knowledge, is no longer feasible. A significant turning point in medical education came with a report recommending that the educational process be directed more towards learning to problem solve, gaining skills to ensure life-long learning, and emphasizing health care (Coggeshall 1965). In response, new schools of medicine were developed, many taking these recommendations as their ideological starting point.

Two features characterized the "new" schools: (1) a broader psycho-socio-physiologic paradigm for understanding health and illness, and (2) the intergration of skills development and/or clinical experience throughout the curriculum (Lippard and Purcell 1972). Numerous curricular and pedagogical innovations were infused into these new medical educational programs, including: use of simulated patients, computer-assisted instruction, systems biology, behavioral objectives, and medical problem solving. Each innovation was informed by the then current thinking in educational psychology, management science or curriculum. Each was inspired by a specific instructional or research problem and each was seen as a means to increasing the relevance and effectiveness of the educational program, i.e. increasing the student's professional competence. Despite these intense efforts, undergraduate medical education programs typically persist in emphasizing the acquisition of knowledge of disease (Armstrong 1977; Engel 1978; Jonas 1978; Weed 1978). The relationship of this knowledge to the acquisition of competencies necessary to perform in the professional role remains unaddressed.

Evaluation has been a central feature of the modern scientific curriculum. The earliest student evaluation efforts of medical schools were given to the student selection process. Subsequent efforts, consistent with the emerging psychometric theory, were concerned with reliably measuring course achievement. Throughout the twentieth century, boards of examiners have assumed the social responsibility of determining the "competence" of graduates of medical schools. These boards have persistently attempted to improve the credentialling examination in keeping with current conceptions of "competence" and measurement theory (Hubbard 1971; Senior 1976). Evaluation of candidates for licensure, originally conducted at bedside by master-physicians, has thus become a pencil and paper examination of knowledge and medical problem solving.

More recently medical school evaluation efforts, concomitant with changes in curriculum, have focused on measuring clinical performance. The literature is replete with reports of methods for measuring clinical performance, including: the objective structured clinical examination; patient management problems; audits of medical records, supervisors' reports, and project work; and case studies (Harden 1979).

Clinical performance evaluation has posed significant problems for educators. Since clinical situations differ for every student, equivalent testing conditions cannot be established for all students. And, since evaluators (especially in community-based programs) are busy, independent, idiosyncratic clinicians, standards for evaluation vary and comprehensive written reports are difficult to obtain. Educators have faced three major problems arising from the complex nature of clinicial performance evaluation: reliability, validity and precision.

Despite persistent and creative efforts to overcome these measurement problems studies continue to find that there is little, if any, correlation between academic performance and professional performance (Price 1971; Wingard and Williamson 1973; Bunda and Saunder 1979). Underlying the many and knotty problems of designing and evaluating medical education has been a fundamental problem: the lack of a clear and valid conception of medical competence and competence-based education.

Medical Competence and Competence-Based Education

Medical educators have gradually shifted their focus towards a competence development conception of medical education (Samph and Templeton 1979). A recurring theme in the discussions of medical education is the need to think of medical education as a lifelong continuum of professional competence development (McGaghie, et al 1978; Taskforce on Graduate Osteopathic Education 1979; American Board of Medical Specialties 1979; Samph and Templeton 1979). The current concern for clinical competence calls for re-examination of educational policies and assumptions. Educational institutions have responded in various fashions to these new demands: modifying admissions criteria, employing professional educators and evaluators, including or increasing social and behavioral science subject content, framing new paradigms for distributing health care resources, utilizing community health care resources in the educational process, introducing students to clinical skills and clinical settings early in the program, and requiring students to demonstrate that they can perform in clinical situations.

"Perform what?" and "how?" have been the central questions educators have attempted to answer during the past several decades (Burg and Lloyd 1979; McGaghie 1978). Nearly all efforts have been directed towards answering the first question, "perform what?" Extensive efforts have been made, particularly by medical specialty boards, to define the role and tasks of physicians. Early efforts, which resulted in identifying nine broad task areas including history, physical examination, tests and procedures, etc., have been refined and expanded to include criteria for performance (to attain specialty certification). In addition, there have been proposed theoretical models by which to make more clear the desired clinical competence and the context in which it is to be demonstrated (De Luca et al 1965; Burg and Lloyd 1979).

These recent efforts to clarify the construct competence have gone a long way towards illuminating the deficiencies of traditional notions of professional competence and medical school curriculum design. But, although in at least one area of professional competence, medical problem solving, differences in trainees and professional-level competence have been shown (Elstein, Shulman and Sprafka 1976), there continues to be no specific definition (standards) of clinical competence for medical students. And, although advocated (McGaghie 1979), no effort appears to have been made to define differences in students' competence at different levels of medical school training.

Despite what appears to be a wide-spread concern for defining, developing and evaluating medical competence, competence-based medical education is only now being seriously considered as a curriculum model. That is, despite the inclusion of early clinical experiences in the medical curriculum and extensive efforts to improve clinical evaluation, medical education has continued to emphasize the acquisition of <u>knowledge</u>. The World Health Organization recently proposed that medical education programs be designed following the tenets of competence-based education (McGaghie et al 1979), thus emphasizing the attainment of functional competence.

Unfortunately, no single definition of "competence," nor any single conception of the structure of CBE programs has emerged from the studies of the teacher education CBE programs which have provided the basis for current theory (Burke et al 1975; Frahm and Covington 1979; Nickse 1981). The lack of a definition of competence and the lack of established standards by which to judge student competence are acknowledged as the major barriers to establishing competence-based educational programs (Senior 1976; Bunda and Saunder 1979; McGaghie et al 1979; Spady and Mitchell 1977; Monjam and Gassner 1979). It has also been pointed out that competence-based educational programs must also reflect the nature of the process by which students acquire the desired competence (McDonald 1974).

Medical educators have increasingly attempted to reflect the nature of the physician's practice role in the content of their curricula, thus meeting the first criteria of a competency-based educational program. The other criteria, designing the program to reflect the nature of the acquisition process by which the student physician acquires those professional competencies, has most frequently not been met. Osteopathic as well as allopathic medical education programs have neither established explicit standards of professional competence for graduates, not characterized the process by which students acquire professional practice competence. A conceptual framework of the continuum of professional competence development remains to be described in order that the necessary theory and definitions for a model of competency-based osteopathic medical education can be developed.

Purpose of the Study

The current study was undertaken to describe the continuum of clinical competence development, towards conceptualizing a competence-based educational program for osteopathic medical students. Consistent with the principles of CBE the study was conducted from the perspective of the student rather than from the perspective of the goals of the curriculum or the objectives of the instructors: what students described themselves as able to do in the clinical setting and why.

Preliminary studies of the MSU-COM curriculum and extensive interactions with MSU-COM students had led the investigator to certain preliminary conceptions of clinical competence development in osteopathic undergraduate medical education. The study began with those preconceptions. Figure 1.1 uses a Guttman mapping sentence to describe the assumed relationships of the content of the program (Facet A) to the clinical conditions of practice (Facets C-F), and learners' activities (Facets B and G) and performance levels (Facets H-L). Certain systematic relationships, as revealed in Table 1.1, represent the differences thought to characterize Unit I, Unit II and Unit III student competencies and performance behaviors. Specifically, these preconceptions propose that students at each of the three levels of training are able to assume different tasks and to solve different medical problems, because they have different knowledge and are in different practice settings. The study also assumes, as do traditional clinical evaluation criteria, an idealized professional-level standard against which to judge independence, accuracy, efficiency and confidence. And yet, this preconception was not altogether satisfying, since students' anecdotal accounts of their performance did not always affirm its basic assumption: clinical competence follows didactic instruction.

This study, then, was designed to elucidate the process by which MSU-COM students acquire professional skills, and to confirm the presumptions regarding the competencies acquired at each of the three levels. Specifically, the study addressed two central questions:

- **What clinical skills (competencies) have students acquired by the end of each of the three phases of the educational process?**
- **What conditions facilitate or inhibit competence development?**

A related question guided the investigation:

- **How does the formal coursework (theory) relate to the development of clinical competence (practice)?**

The central purpose of the study was to describe as accurately as possible, the complex process of clinical competence development in order to guide more definite research. The immediate intent was to refine the initial statement to reflect both the variables that affect learners and the competence they describe. That is, it was thought that such an exploratory, descriptive study was a necessary first step towards developing a conceptual framework for competence-based osteopathic medical education. It was also anticipated that the descriptive statement of subjects would be of particular interest to administrators of the MSU-COM curriculum.

Figure 1.1

PRELIMINARY CONCEPTUALIZATION OF THE CONTINUUM OF CLINICAL COMPETENCE DEVELOPMENT

Depending upon his/her previous clinical experience, the student completing

(A) Actor

- a_1 Unit I
- a_2 Unit II
- a_3 Unit III

can be expected to

- b_1 collect medical history data
- b_2 elicit chief complaint
- b_3 conduct physical exam
- b_4 write reports
- b_5 self-evaluate
- b_6 interpret data
- b_7 propose problem list
- b_8 plan/conduct diag. tests
- b_9 propose diagnosis
- b_{10} plan/implement treatment
- b_{11} plan/implement management
- b_{12} educate patient/family

on a

referent system

(C) Referent

- c_1 surrogate patient
- c_2 ambulatory patient
- c_3 hospitalized patient

who presents with a chief complaint of

(D) Presentation

- d_1 no complaint
- d_2 functional limitation
- d_3 pain
- d_4 fever
- d_5 malaise
- d_6 bleeding
- d_7 unconsciousness
- d_8 irrational behavior

of

(E) Duration

- e_1 acute
- e_2 chronic

duration and who is

(F) Behavior

- f_1 cooperative
- f_2 uncooperative

and to make, or perform from, a diagnosis of

(G) Diagnosis

- g_1 normal
- g_2 a structural disorder
- g_3 a hematologic disorder
- g_4 a neurologic disorder
- g_5 a respiratory disorder
- g_6 an endocrine disorder
- g_7 a gynecologic disorder
- g_8 a cardiovascular disorder
- g_9 a renal disorder
- g_{10} a gastrointestinal disorder
- g_{11} a dermatologic disorder
- g_{12} a psychopathologic disorder
- g_{13} a multisystem disorder

response mode

$\longrightarrow$ *in a manner which*

considers

(H) Factors

- h_1 physical
- h_2 psychological
- h_3 sociological

factors and seeks

(I) Assistance

- i_1 confirmation of all findings
- i_2 approval of plans for action
- i_3 consultation as needed

(assistance) and performs with

(J) Accuracy

- j_1 low
- j_2 medium
- j_3 high

accuracy and

(K) Efficiency

- k_1 low
- k_2 medium
- k_3 high

efficiency and

(L) Confidence

- l_1 low
- l_2 medium
- l_3 high

confidence and

(M) Ethics

- m_1 low
- m_2 medium
- m_3 high

ethics.

Figure 1.2

PRELIMINARY STATEMENT OF THE RELATIONSHIP OF THE LEVEL OF TRAINING TO VARIABLES

IN THE CONTINUUM OF CLINICAL COMPETENCE DEVELOPMENT

ACTOR (A)	TASK (B)	REFERENT (C)	PRESENTATION (D)	DURATION (E)	BEHAVIOR (F)	DIAGNOSIS (G)	FACTOR (H)	ASSISTANCE (I)	ACCURACY (J)	EFFICIENCY (K)	CONFIDENCE (L)	ETHICS (M)
UNIT I	$b_1 \ldots b_5$	$c_1 \ldots c_3$	$d_1 \ldots d_5$	e_1, e_2	f_1	--	$h_1 \ldots h_3$	i_1	j_1	k_1	l_1	m_3
UNIT II	$b_1 \ldots b_7$	c_1	$d_1 \ldots d_5$	e_1, e_2	f_1, f_2	$g_1 \ldots g_{12}$	$h_1 \ldots h_3$	i_2	j_2	k_2	l_2	m_3
UNIT III	$b_1 \ldots b_{12}$	$c_1 \ldots c_3$	$d_1 \ldots d_8$	e_1, e_2	f_1, f_2	$g_1 \ldots g_{13}$	$h_1 \ldots h_3$	i_3	j_3	k_3	l_3	m_3

Definition of Terms

Certain terms, used throughout this report, require clarification.

Continuum of Clinical Competency Development

As used in this study, the continuum of clinical competence development refers to (1) the entire length of the student's undergraduate osteopathic medical educational program, and (2) the continuous and cumulative process of acquiring and integrating the skills, knowledge and attitudinal behavior needed to perform in the professional role in the clinical setting.

Although the process of developing professional competence is considered to be an on-going process of accretion, practice and refinement, for the purposes of this study the educational program will be viewed as three units, each providing certain skills, knowledge and practice opportunities, the sum of which results in the student performing professional tasks in a particular manner. Implicit in this notion of competency development is that it is an individual process.

Competence

Competence is defined in the Oxford English Dictionary as "sufficiency of qualification; capacity for dealing adequately with the subject." Implicit in this definition is the distinction between the capacity (competence) to carry out a particular task, and the actual carrying out (performance) of that task. In order to attribute 'competence' to a person, however, we are constrained by what we observe of his/her performance. That is, inadequate performance does not necessarily infer the absence of competence. Typically, "a definition of competence in medicine describes the generally agreed-upon capabilities that members of that profession should possess." (American Board of Specialties 1979, p. 11). The present study assumes that there is a continuum of competence development; hence, the definition of competence will differ at the various stages of the educational program. That is, while the content of the program is derived from definitions of practitioner competence, the students' process of acquiring that terminal objective will require formative statements of competence for each of the stages of the program. This assumption necessitates the explanation of related terms:

Clinical competence: The knowledge, skills and attitudinal behaviors requisite to performing professionally related tasks in the clinical setting, at a particular stage in the student-physicians educational program. No *a priori* descriptions of the specific capacities nor any standards of performance are implied by the construct. The study attempts to define clinical competence at each of the three stages of the educational program.

Clinical tasks: The functions that student-physicians perform in the clinical setting while providing care to patients. Tasks deduced from the curricular materials studied include:

1. collect medical history data
2. elicit patient's chief complaint
3. perform physical examination
4. write reports
5. evaluate own performance
6. interpret data
7. propose problem list
8. plan/conduct diagnostic tests
9. propose diagnostic hypothesis
10. plan/implement treatment
11. plan/implement management
12. educate patient/family

Clinical competencies: The specific and generic clinical tasks student-physicians do or are expected to be able to perform.

Performance levels: The description of the behaviors of student-physicians when performing clinical tasks, with regard to: the task performed and the accuracy, efficiency and confidence with which it is performed.

A Conceptual Framework: As used in this study refers to a

> carefully engineered framework designed to identify and reveal relationships among complex, related, interacting phenomena; in effect to reveal the whole, where wholeness otherwise might not be thought to exist. Such a system is designed to desribe and classify categories which can be readily discussed and manipulated at consistent, clearly identifiable levels of generality, and which can be developed from different perspectives.
> (Goodlad and Richter 1966, p.1)

As Goodlad further described a conceptual system, it is: broader in scope than a theory but less precise and predictive; intended to be neutral with regard to a theoretical perspective, thus suggesting hypotheses for investigation but not specifying any particular hypothesis; concerns itself with general questions that derive their viability from the fact that they persist in practice; and must be able to deal with the ends and means of education as experienced by the students. Once described, the conceptual framework, according to Goodlad, would facilitate:

- the identification of problems and questions having relevance to planning competency-based medical education programs,
- the clarification of types of inquiry likely to be productive in exploring these problems and questions,
- the revelation of possible connections among the various problems, and the identification of promising data-sources for dealing with the problems and questions.

Assumptions

The essentional assumptions which underlay this study were:

- an educational program which provides clinical practice experiences throughout the curriculum is a valid subject for study regardless of its intent regarding clinical competence development,
- the content of the clinical curriculum reflects a valid representation of case study in the nature of osteopathic medicine and its practice,
- student performance is a valid basis for describing the continuum of professional competency development,

- task performance can be described and compared on the basis of self-reported behavior,
- clinical competence development is a cumulative phenomenon which can be analyzed at different stages, distinguishing capabilities and illuminating factors influencing those capabilities.

Limitations

The study is exploratory and descriptive rather than experimental. Neither the initial statement (Figure 1.1) nor the subsequent description of a conceptual framework proposes causal, predictive relationships among variables.

No measures of actual student clinical performance are included in the study. The variables of learning and performance are limited to students' perceptions of the educational-learning process and their clinical expertise.

The data was collected from students in one osteopathic medical college. Moreover, the data represents three different groups of students, one for each of the three levels of the program.

Conduct of the Study

The data for the current study was gathered from thirty-seven (37) selected students of the Michigan State University College of Osteopathic Medicine (MSU-COM) who volunteered to participate in structured research interviews. The interviews were guided by an interview schedule unique to each phase of the program but which emphasized common tasks and issues (Appendix A, B, C). Most interviews were recorded by tape recording and the tape transcribed verbatim. The transcriptions were analyzed in two stages using content analysis: first, a qualitative analysis was used to identify clinical skills, performance descriptions, learning process variables, and learner variables for each stage of the program; second, a contingency analysis was conducted in order to reveal associations between the identified variables.

Overview

Chapter II is devoted to a survey of literature relevant to the present study. This survey is organized into three parts: concepts in competency-based education, issues in learning and competence development, and medical competence. Chapter III describes the methodology of the study, specifying the study populations and samples, the development of the interview schedule, and providing a rationale for the means of analysis.

Chapter IV and V provide a detailed report and analysis of the findings. Chapter IV describes the students' perceptions of the continuum of clinical competence development, while Chapter V describes their perceptions of the variables affecting the developmental process.

Chapter VI presents the investigator's insights, conclusions, and recommendations.

CHAPTER II

REVIEW OF RELATED LITERATURE

At this time, there is neither descriptive nor prescriptive theory establishing a framework for competency-based education (Tarr 1974). There is, however, a plethora of literature in such diverse disciplines as psychology, curriculum, sociology, medicine, philosophy, management science and educational psychology that bears on the subject. The literature review presented here makes no attempt to provide an exhaustive exploration of the many tendrils of associated theory and notions, but, rather, attempts to expose the taproots of the concepts and issues of competency-based education (CBE) pertinent to the medical educator.

This review is organized into three sections. The first section focuses on the general concepts and rationale of competency-based education programs. The second explores issues related to competency-based education in the literature of diverse disciplines thought pertinent to the CBE teaching/learning process. The final section surverys the limited literature on physician competence and competency-based medical education.

Fundamentals of Competency-Based Education

If there is a single, defensible statement to be made about competency-based education, it is that there is no single definition of "competency" nor any single conception of the structure of CBE programs (Burke et al 1975; Frahm and Covington 1979, Nickse, 1981). Competency-based education has had two primary sources of impetus: (1) pedagogical advancements growing out of training psychology, social learning theory and systems analysis, and (2) social policy changes engendered by the various historic progressive and liberal movements, especially the recent civil rights movement (Elam 1971; McDonald 1974; Burke, Hansen, Houston and Johnson 1974; Gale and Pol 1975; Merrow 1975; Huff 1976; Spady 1977; Spady and Mitchell 1977; Grant and Associates 1979; Benoist and Gibbons 1980). The very fact of these two separate, sometimes contradictory, well-springs of life is cause enough for the inconsistency in terminology and uncertainty in conceptualizing CBE programs.

Conceptions of Competency-Based Education

Definitions of competency-based education have emerged from two different approaches to examining the phenomenon: (1) post-hoc analysis of self-described competency-based programs, and (2) a priori prescriptions of the criteria for such programs (Spady 1977).

Post-hoc analysis: Early efforts to characterize competency-based education were based on analyses of self-proclaimed competency-based teacher education programs.[1] An early conceptual analysis, posed five essential elements of competence/performance-based education programs:

(1) competencies (knowledge, skills, behaviors) to be demonstrated by the student are
- derived from explicit conceptions of teacher roles,
- stated so as to make possible assessment of a student's behavior in relation to specific competencies, and
- made public in advance;

(2) criteria to be employed in assessing competences are
- based upon, and in harmony with, specified competencies,
- explicit in stating expected levels of mastery under specified conditions, and
- made public in advance;

---

1 See Roth, R.A. A Study of Competency-Based Teacher Education for a comprehensive review of the literature.

(3) assessment of the student's competency
- uses his performance as the primary source of evidence,
- takes into account evidence of the student's knowledge relevant to planning for, analyzing, interpreting, or evaluating situatins or behavior, and
- strives for objectivity;

(4) the student's rate of progress through the program is determined by demonstrated competency rather than by time or course completion;
(5) the instructional program is intended to facilitate the development and evaluation of the student's achievement of competencies specified;

and several additional, related desirable characteristics:

(1) the program is field centered;
(2) there is a broad base for decision-making (including such groups as college/university faculty, students, and public school personnel);
(3) the materials and experiences focus on concepts, skills, knowledges, which can be learned in a specific instructional setting;
(4) both the teachers and the students are designers of the instructional system;
(5) (the program) includes a research component and is open and regenerative;
(6) preparation is career continuous;
(7) role integration takes place as the prospective teacher gains an increasingly comprehensive perception of teaching problems.

(Elam 1971 in Houston 1974, pp 9-10)

While refinements of these characteristics subsequently have been proposed (Burke et al, 1975), the various conceptualizations of competence-based education emphasize three characteristics:

1. specification of educational outcomes reflecting successful functioning in life roles,
2. view that instructional time is independent of the achievement of those outcomes,
3. the certification of the achievement of the outcomes in a reasonably objective and verifiable way.

Gamson 1979, p. 225

A typical, generic but narrow definition of competency-based education is that of McAshen:

> An educational program in which the desired learning outcomes or competencies and the behavioral outcomes or evaluation indicators are specified in advance in written

> form. In addition, each of these components is visibly associated with an instructional delivery system that incorporates a module as the basic component. In these programs, competencies are considered to be ends and to have intrinsic value.
>
> (1979:45)

A broader definition is posed by Parker and Taylor:

> Competency-based adult education is a performance-based process leading to demonstrated mastery of basic and life skills necessary for the individual to function proficiently in society.
>
> (1980:12)

A priori definitions: A priori definitions of competency-based education have primarily been concerned with refinement of the definitions of specific concepts within the broader definition of CBE. For example, McDonald (1974), concerned with the concept 'competence' particularly with regard to teacher education programs, characterized teaching competence in terms of observable performances.

In another early attempt to address the problems of post-hoc definitions of CBE, Gale and Pol 1975, described a conceptual scheme based on internally consistent definitions and logic. In this scheme competence is seen as a molar concept designating a complex of interrelated elements--abilities, knowledge, judgment, skills, attitudes and values--required to adequately perform the tasks and assume the role of a specified position. In this scheme, one can visualize a many-layered, spiralling cone, each layer representing an area of competence, with each layer developed to a unique level of proficiency and degree of competence and interrelated by common components of competence. According to Gale and Pol

> no two instructional technologists, for instance, will possess the same indentical sets of skills, abilities, knowledge, etc., nor will they be capable of exercising these to the same degree and level of proficiency.
>
> (p. 20)

Monjam and Gassner (1979), in arguing for "process-oriented" competencies, stated:

> the standards by which one judges a behavior is determined by the situation in which the behavior occurs. There is no one standard for a behavior which will be appropriate (necessary and sufficient) over a number of circumstances. . . Most competencies are product-oriented; i.e., they treat specific events as manifestations of ability without concerning themselves with how and when the occurrence of the specific event reflect the generalized capacity to engage in the essential process. To require only a finite product as the proof that competence exists is to risk trivializing the educational attainment.
>
> (p. 79, 80)

Chickering and Claxton, in trying to answer the question, What is competence?, brought together the various perspectives into a set of basic principles of competence and competency-based education:

> . competence is internal, situational and personal;
> . competence is limited by a person's perceptions, neurological system, and character;
> . achieving competence requires diverse learning styles;
> . competence itself is a motivational force.
>
> (1981:11)

Pottinger similarly concluded from his review of the literature on professional competence that:

> 1. the domain of competence is complex; including several dimensions of behavior; e.g., thoughts, feelings, and actions;
> 2. the domain of competence is dynamic; knowledge, skills and abilities characterizing competence at one level of the profession may be quite different from that characterizing another level;
> 3. environmental variables are powerful mediators of job performance;
> 4. the domain of competence is individualistic; different practitioners can competently manage the same problem in different ways.

Such broad notions of competence and competency-based education pose difficult, practical problems for CBE program designers deciding what capacities lead to the acquisition of competence, the development of instructional/learning experiences to facilitate their acquisition, and development of means to certify

such competence. No small part of the problem lies in the difference of perspectives among those who structure the program.

Structuring Competency-Based Programs

Central to the concept of competency-based education is the awarding of credentials on the basis of demonstrated competence. The program must be structured to provide students the opportunity to achieve competence. It must be evaluated to determine its success in achieving that goal. As was previously noted, CBE has a number of antecedent conceptual bases, including training psychology, mastery learning, and social learning theory. Systems theory has been used in planning and managing CBE programs since, as in most social systems, CBE programs pose for the planners problems which have variable solutions and many constraints (Lehmann 1971). The systems perspective provides an elegantly simple planning scheme.

One such planning model for constructing competency-based programs, proposed by Huff (1976), includes the following steps:

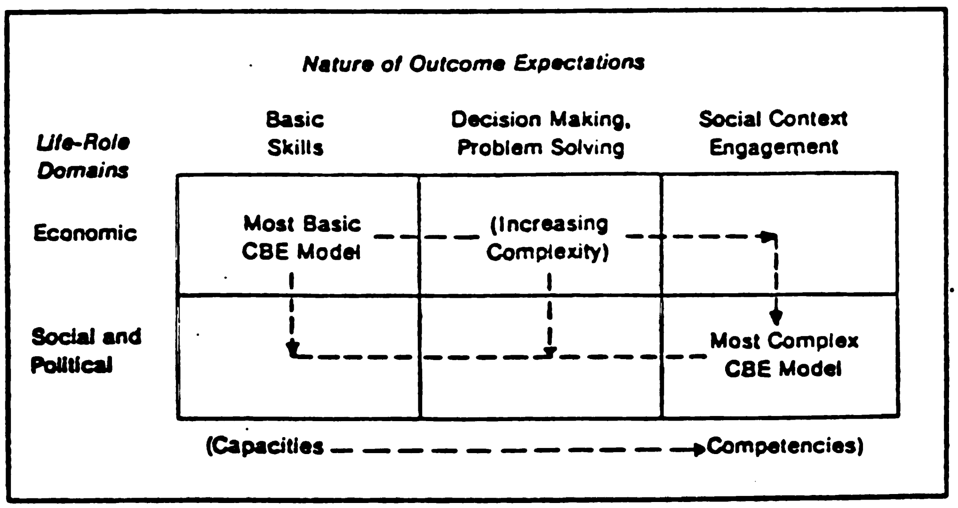
- Specification of educational goals
- Statement of amenable goals in terms of student competencies (operational definitions)
- Development of commensurate performance measures for competencies and the development of indicators for goals which do not lend themselves to specification in terms of competency or direct assessment
- Design of learning experiences of learning environments appropriate to attaining goals and competencies
- Development of approapriate pedagogical methodologies
- Determination of structural and procedural changes needed to accomomodate programs
- Determination of faculty and faculty competencies
- Determination of faculty development needs
- Design of faculty development programs
- Specification of criteria to be used in evaluating faculty performance
- Development of program evaluation criteria including cost-effectiveness studies

(p. 50)

This planning model, as is the case of most ideal types, transcends the philosophic and political differences educators bring to the actual planning process. Educators differ on both the purpose and intent of competency-based programs. McDonald (1974), for example, argued that the characteristics of competency-based (teacher) education programs neither "... justify the design of any one program over another nor do they prove that competency based programs necessarily produce better teachers" (p. 180).

Spady and Mitchell (1977) shed some light on these variations in approach to structuring and assessing CBE programs, by demonstrating two typologies of CBE programs. The first typology describes programs based on outcome expectations (p. 10):

Figure 2.1



Here the most basic CBE model is probably best characterized by public school programs which are intended to strengthen the accountablility of students and teachers, and are evaluated by minimum competency testing (Thurston and House 1981). The more complex model involving not only basic skills but life role-related skills in decisions making and problem-solving might be characteristic of CBE programs advocated for medical education (MCGaghie et al 1978; American Board of Medical Specialties 1979). The most complex CBE model has few exemplars; one example may be Alverno College curriculum (Grant et al 1980).

The second typology is based on the designer's approach to <u>student learning</u> opportunities (p. 13):

Figure 2.2

	Orientations to Student Opportunity Structures	
Program Structure Approach	Narrow Scope, High Performance Expectations	Broad Scope, High Life-Role Relevance Expectations
Role based	"Moderate Traditionalists"	"Humanistic Critics"
Goal based	"Accountability Advocates"	"Reform Advocates"

It is important to note that in this typology the authors' reference to "role based" refers to the <u>student</u> role, while "goal based" infers <u>program</u> goals.

Spady and Mitchell point out that each approach to competency-based education imposes certain advantages and disadvantages. They argue, for instance, that structures that emphasize the student role enhance program control but stifle learner motivation; and accountability mechanisms such as certification examinations usually require narrowing of program goals to correspond to certification requirements. Spady and Mitchell further content that

> to the extent that reform approaches to CBE mandate the demonstration of capabilities that go beyond mastery of

> discrete basic skills and require engagement in life-role situations, they represent a challenge to a substantial segment of the school's curriculum structure and institutional resources.
>
> (1977:13)

This is due, they say, to two factors: (1) the discipline-centered nature of the standard curriculum and instructional resources, and (2) the predominant use of pencil-paper and standardized tests and controlled testing environments. Both of these characteristics have limited utility in a complex CBE program, they argue.

McDonald (1974) presaged this conception of structuring competency-based education, endorsing the notion that a behavioral description of the life-role performance is necessary, but he argued that the content so identified is an insufficient condition of CBE programs. In addition to life-role analogous content, McDonald argues, a CBE program must have a rationale for its instructional design, based on the nature of the acquisition process by which competence is learned.

Thus, the conceptual framework of any CBE program is, in large measure, a reflection of the planners' political and/or philosophic intents.

Issues Related to Operationalizing CBE Programs

Certain problems and issue are particularly cogent for the medical educator designing a competency-based program: developing competency statements, establishing and evaluating criteria, and designing teaching/learning strategies; problems which are common to all competency-based educational programs and to which a broad range of disciplines have been addressed.

Developing Competency Statements

As has been noted, statements of competence are the crux of CBE; they operationalize the philosophy of the conceptual framework of the program and reflect the political and educational priorities of the program planners.

Block (1978) suggested four steps in operationalizing the concept of CBE:

1. accumulate conceptions of the life-role from those who have a stake in the students outcomes of the educational process and/or from extant research;
2. evaluate the accumulated conceptions and help practitioners make explicit value-choices among various defensible alternatives;
3. translate the approved conceptions into "school competencies" analogous to the life role; identify the capacities for each competency; and determine the affective capacities; and
4. provide instructional strategies that ensure nearly all students master the capacities and competencies.

Opinions have varied as to who should be involved in selecting competencies (Huff, 1976; Popham, 1981), but traditionally competencies have been identified by study of practitioners, through:

1. job observation - utilizing an open-ended or a carefully pre-designed observation schedule, one observes job incumbents at work noting the specific behaviors in which they engage;
2. worker interrogation - rather than actually observe the work in progress, one may interview persons who do the work or ask them to complete a questionnaire describing what they do; or,
3. expert opinion - by processes of interview and discussion, those considered knowledgeable in the field are asked to specify the kinds of skills, attitudes, and knowledge required to perform effectively in the given area of work. Existing literature may be used.

(Canfield, 1972:3)

None of these methods is without problems; however, whatever the methods, CBE program planning starts with some description of the role for which the program is intended to prepare students (Canfield and Morgan, 1972). The translation of that description into competency statements and the manner in which the competencies are gained through the program, are a reflection of the planners' notion of competency-based education. As Chickering and Claxton pointed out, "<u>how</u> people go about defining competence and selecting areas for program development may be more important than <u>what</u> is selected at the outset, because the process will determine the direction of further thought and selection" (1981:8).

Traditional methods of identifying competencies are normative and task-oriented, involving the analysis of what is currently done in the functional role under study and determining the skills, knowledge, attitudes and values characteristic of persons performing the tasks. The planner is primarily interested in identifying competencies which are relevant to the life role and which can be taught and evaluated directly. The competency statements are likely to be written as content-bound behavioral objectives which emerge from relatively simple questions posed by the researcher: "What does a person in that role do? What does that person need to know and be able to do in order to perform those tasks?" Answers to these questions provide the basis for specific statements of what the person does, and the knowledge and skills thought to undergird those performances (Kurtz, 1976; Dailey et al, 1974).

Woditsch cautions that a normative approach only insures maintenance of the status quo, and that "if what we want tomorrow is . . . some unprecedented combination of yesterday's successes and today's hopes, the way most men behave cannot be our norm" (1976:17). It has also been argued that the job function analysis approach, based primarily on motor skills analysis, is too narrow for analyzing complex professional competence, and that the behavioral objectives approach, resulting in elaborate taxonomies of job skills, neglect significant variables of job performance such as intrapersonal and environmental variables (Nash and Agne 1975; Pottinger 1979; Moujan and Gassner 1979).

Pottinger recommends McClelland's behavioral event analysis technique as a means to identifying the skills and abilities that enable the observable behavior. Here the assumption is that behavior is not synonymous with competence. Studies using this technique have consistently identified three dimensions of performance related to competence: cognitive process abilities, interpersonal skills and motivation. Monjan and Gassner argue for process-oriented competence sta

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statements, where processes are defined as "operations rather than events [which] can be applied in a variety of situations and are not content specific" (1979:79).

From their extensive review of the psychological literature on assessment of competence, Sundberg, Snowden and Reynolds conclude that the notions of competence must go beyond performance of the technical procedures to consider behavior-environmental-cognitive style interactions, and to incorporate the concepts of personal development, self-management and self-understanding. Specifically, they suggest that:

> a comprehensive model of assessment must take into account the person's stimulus selection and categorizing process, self-regulating and goal concepts, the potential behavior repertoire, situational expectations, and response selection in the interacting feedback loop with the environment. Such a conceptualization might be entitled the <u>assessment of ecological competence</u>.
>
> (1978:207)

These recent notions of competence counter earlier reductionistic, behavioristic conceptions which were intuitively and theoretically oversimplied, but they pose new problems for evaluators.

Evaluating Competence

Evaluation, similarly to the process of defining competence, follows the philosophic framework of the educational program. Evaluation in traditional educational programs has primarily consisted of quantitatively measuring student performance on written examinations. Recent arguments have pointed up the limitations that quantitative methods have placed on research and evaluation in education (Cronbach 1974; Campbell 1974; MacKinnon 1975; MacDonald 1977; Monjan and Gassner 1979; Patton 1980). Evaluation of educational <u>programs</u> is yet another problem, one which is less frequently addressed, although standard models of evaluation have existed for some time (House 1980; Nelson 1970; Stake 1974; Guba 1977; Alkin and Fitz-Gibbon 1975).

Issues in measuring student performance. The principles of tests and measurements persist as problems in evaluating competence defined as an ability, and in some instances are made more problematic, since there are no direct measures of ability. Monjan and Gassner (1979) re-examined two central issues of measurement in light of their conception of competence as the ability to perform certain cognitive processes: accuracy and significance of assessment procedures. They attribute accuracy to reliability of the testing procedures, sampling techniques and the expertise of the evaluator; whereas, significance is reflected in the validity of the procedures. Their discussion highlights the conventional measurement issues:

- reliability
- sampling
- expertise of the evaluator
- significance
- construct validity
- content validity
- predictive and concurrent validity

Pottinger (1979) outlined and discussed five related concepts that need to be considered in developing professional licensure/certification evaluation procedures.

1. Measuring cognitive processing skills rather than knowledge. Although time and money saving, multiple choice tests of knowledge do not represent what people are required to do in their professional lives. Klemp (1977) found that individual's amount of knowledge in a content area to be unrelated to either superior or marginal performance. He instead showed three cognitive skills related to competent performance in a wide variety of occupations: (1) the ability to see thematic consistencies in diverse information and the ability to organize and communicate those consistencies; (2) the ability to conceptualize the many sides of a controversial issue; and (3) the ability to learn from experience. McGuire (1963) defined seven levels of the cognitive domain of medical practice: recall of isolated information; recognition of meaning or implication of performance; simple interpretation of data or application of a single principle or standard combination of principles; analysis of data or application of a unique combination of principles to a novel problem; evaluation of a total situation; and analysis of a variety of elements of knowledge and application to a novel problem situation in its entirety.

2. The problem of method variance. Evaluators, particularly those concerned with certifying and/or licensing, have tended to use one evaluation modality, the pencil and paper test. It is as likely that the affect of the test format is being measured as is the individual's professional knowledge and abilities.

3. The problem of complex skills interactions. Research has shown that competence is not a simple summation of discretely defined subunits of knowledge and skills or personal characteristics, but most written examinations assume that a sum of the scores on sub-units of the exam is a measure of competence. In fact, competence in one skill area can compensate for deficiencies in others, and too, people can solve identical problems in different ways--facts which current written exams do not take into account.

4. The problem of maximal levels. The tacit assumption that superior abilities in measured skills or characteristics are desirable is questionable. Research has shown that abilities, essential at minimal levels for competence, present at maximal levels are negatively correlated with superior job performance. Thus, policies requiring more than minimal scores for certification, for example, may be not only unfair but dysfunctional to up-grading the profession.

5. Generic skill vs. observable performance skills. Evaluation methods need to take into account the variables which determine successful performance in practice. Efforts have been made to develop tests that simulate the practice task, however, they have not always correlated with actual job performance. For example, the patient management case used in medical schools during the past decade have correlated with medical school course grades but have not been predictive of job performance. On the other hand, interpersonal, motivational and other personal characteristics intuitively related to job success are rarely measured. Evaluation methods have traditionally been concerned with cost, objectivity, and reliability; they have not assured validity.

Grant and Kohli (1979) raise another critical issue in evaluating students in CBE programs: the standard of reference. Classical testing methods were intended to compare and rank individuals based on their achievement scores--so-called norm-referenced assessment. Competency-based education, in contrast, assumes some standard of performance and individual performance is compared to that standard reference--so called criterion-referenced assessment. Establishing standards for performance continues to be one of the, if not the, knottiest problems in competency-based education (Spady 1977). Grant and Kohli conclude from their study of specific CBE programs that establishing standards is, in effect, a normative process based on the values of individuals describing the variables of performance, mediated by the purpose of the evaluation. And Conaway (1979) concluded from his survey of the literature, that no set of practical procedures for setting standards in CBE programs now exists; his examples of extant CBE standard setting approaches show them to be arbitrary and normative. He concludes that it is more important that evaluation in CBE programs be diagnostic, and that the program provide time and means to remediate for students who fail to meet the standards. And Jaeger concluded that:

> No amount of data collection, data analysis, and model building can replace the ultimate judgmental act of deciding which levels of performance are meritorious or acceptable and which are unacceptible or inadequate.
>
> (1979:48)

Shepard (1979) too acknowledged the subjectivity both of setting standards and judging students by them. She argues for humane and thoughtful interpretations of evaluative judgments--interpretations that carefully weigh the public and individual good. She offers the following circumspect recommendations for setting standards:

1. <u>Avoid setting standards whenever possible.</u>
   Students progress should be monitored along a performance continuum which reflects degrees of accomplishment ... (and) the fallibility of the placement criterion should be acknowledged by providing easy access to retesting.

2. <u>Make setting standards an inerative process.</u>
   Panels of experts ought to be reconvened when testing results are in ... to find systematic errors that suggest a change in criteria is needed.

3. <u>Include the normative basis of judgments as a formal part of the standard setting process.</u>
   Experts will want to decide what "ought" to be, but they can establish more reasonable expectations if they know what current performance is.

4. <u>Adopt "improvement" as the most reasonable standard.</u>
   In some areas, it may be possible to establish minimal competencies that are absolute and consensual ..., for example, all physicians ought to be able to recognize and treat shock. However, in most areas of education these absolutes do not exist. In these instances "improvement" may be the only defensible standard.

5. <u>Allow for differences of opinion by involving various audiences in standard setting.</u>
   Representative from groups who disagree may be the most straight-forward way of dealing with differences in values, ... they should not be tossed together to

reach consensus on standards. The different groups should meet separately . . . if different standards emerge propose them as different criteria.

6. Protect against focusing on minimums which may limit the height of educational attainment.
Anti-testers are fond of the argument that testing minimums will limit educational growth. Rather than being a plea for less testing, this caution warns of the need for collecting evidence at both ends of the performance continuum . . . Perhaps assessment and rewards for accomplishment beyond the minimums are means for increasing growth . . . .

(1979:67-71)

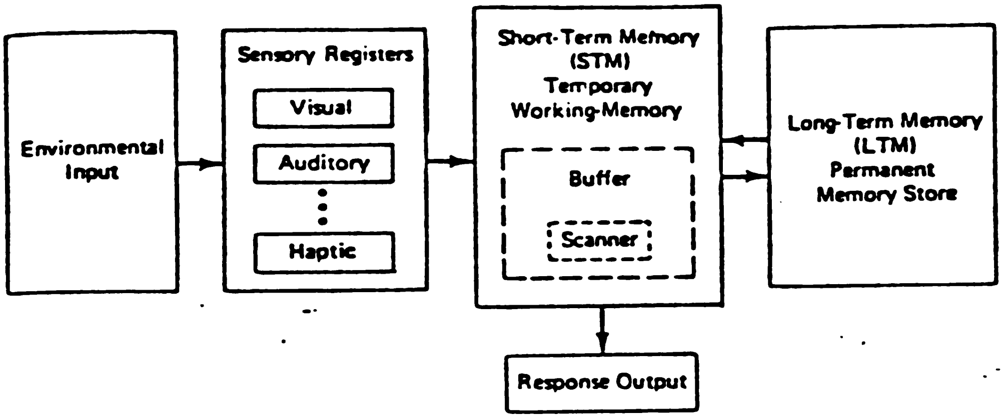
Theories of Learning and Competence Development

Many of the notions of competency-based education initially were posed as principles of mastery learning (Carroll 1963) and learning by objectives (Bloom 1956). Also undergirding the assumptions of CBE is the notion that learning is hierarchically ordered (Gagne 1965). According to this theory, learning tasks can be analyzed into sequentially-ordered sub-tasks, and learning facilitated by mastering each sub-task in its logical order. Implicit is the assumption that complex tasks cannot be mastered prior to mastering each sub-task. It is also assumed that given sufficient time, any student can master the hierarchy of skills. These assumptions have heavily influenced the instructional technology used in defining competencies and establishing standards of performance; however, misunderstanding of the acknowledged limitations of these theories have led educators to take too simplistic a view of competence and competence development (Shepard 1979).

Competence development is a complex phenomenon which involves "mastering" specific cognitive, psychomotor and affective skills, and retaining and transferring those skills to life performance. The basic concepts of current theories of cognition and learning thought pertinent to competence-based osteopathic medical education are highlighted here.

Cognitive Science

Current concepts of information processing begin with a systems or engineering model, such as the one described by Blumenthal:



An example of modern flow-chart analyses of cognitive processes.

(1977:19)

Research in cognitive science has been attempting to clarify each of the sub-processes, althought this metaphor is criticized as being mechanistic and not adequately conveying the arbitrariness with which the self-controlled and changing human organism influences its own perception and memory. According to Blumenthal (1977), certain generalizations about the cognitive process are supported by research:

1. Immediate sensory experience seems to be controlled by rapid attention integrations which are elemental processes that fuse a set of events or impressions into a unitary experience. The degree of integration apparently determines how well an event is perceived or remembered.

2. The organism is protected against sensory overload by a buffer process--a brief preattention delay of input. The delayed events are lost permanently if not subjected to the fixing power of attention integration.

3. What is perceived, recalled or thought of is held for sorting and restructuring in another, longer, buffer process called the short-term memory--a post attention delay.

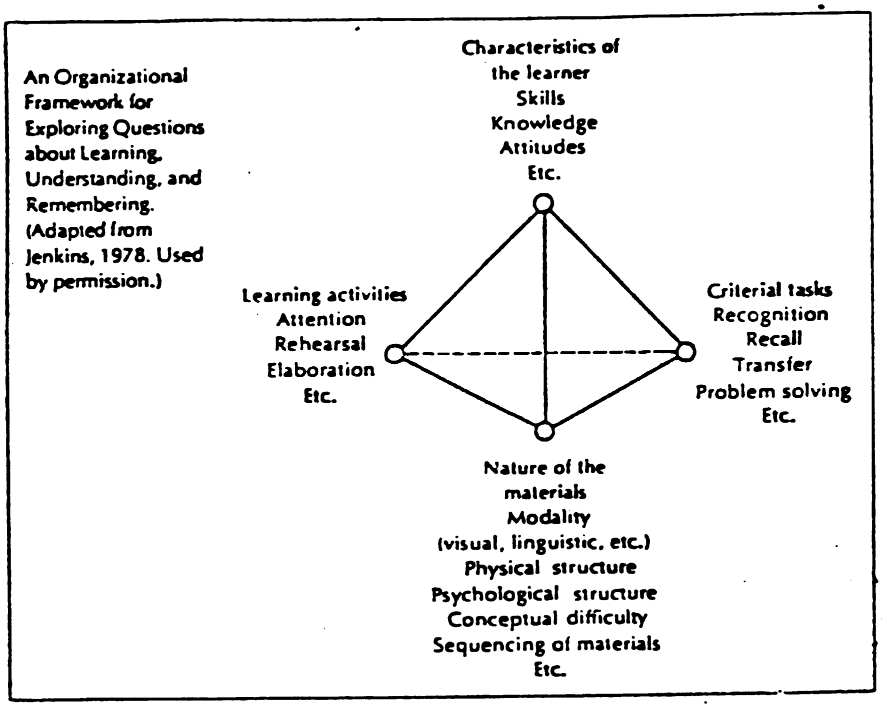
4. There are limits on the number of events that can be grasped at once, held in mind briefly, or used as a basis for making judgments, commonly thought to be 7 ± 2.

5. Emotion arises from reactions of the rapid-attention-integration process in the course of its integration of immediate experience. Emotion can direct the course of cognition--the retrieval of memories, the structuring of thoughts, or the formation of perceptions.

6. Longer temporal integrations (long term memory) are fusions or extrapolations of similarities in attentional patterns (concept, symbol schema or rule) that underlie separate experiences when those experiences are brought together in short-term memory. Psychological factors recognized as being involved in longer temporal integration include: image formation, skilled performance, concepts and schemata, recognition and the self-concept.

7. Cognitive control maintains the interacting components of cognition on one train of action and maintains coherence of thought during acts of making choices and pursuing goals. A key mechanism in the control of these processes is the central emotional reaction. The emotional qualities of experience influence/two dimension of cognitive control: attentional focus and attentional scanning.

Bransford (1979) reviewed similar cognitive science research and organized it around a conceptual framework which recognizes the complex relationships among the factors that attend learning, understanding, and remembering. He suggested that cognitive performance is a function of the relationships among four factors, such that:



(1979:8)

Bransford proposes the following conclusions about learning and learners:

1. Teaching materials and testing should be congruent with one's definition of learning. For example, teaching for recall should not be tested by problem solving.

2. Since learning depends on previous learning, teaching cannot be assumed to result in learning. Modeling, advanced organizers and observation are means of providing students with the necessary context and/or knowledge and skills necessary to learn presented facts, concepts, etc.

3. Age, culture, previous learning, nature of the test, nature of the teaching materials, as well as psycho-physical learning problems, affect test performance.

4. Remedial intervention must take into account factors in learning, understanding, and remembering.

Blumenthal's schema provides us with a way to visualize the 'mechanics' of cognition, and Bransford shows the relationship of the cognitive processes to certain learning factors. Yet, the controlled and contrived experimental research from which these generalizations are derived do not seem to adequately convey how learning actually transpires. Neisser (1976) took up the challenge of developing a theory of cognition with what he called "ecological validity."

The Neisserian conception of information processing assumes that environmental information is not indiscriminately received by the perceiver, but rather anticipatory schemata, consisting of previously acquired knowledge, directs our receptions of stimuli. He says, "We can only see what we know how to look for" (1976:20). But the very act of collecting information modifies the schemata, preparing it for further stimuli. The dynamics of perceptual learning, then, involve: anticipating the event via a schemata; which directs the perceptual exploration; which samples the available information in the environment; which, in turn, modifies the schemata.

Through continuous episodes of perceptual learning, we become able to perceive progressively more subtle aspects of the environment. But there must be meaning associated with these stimuli; they do not in themselves, have meaning. According to Neisser, the perceiver selects among potential meanings based on former knowledge, and, as in the case of perceptual learning, meaning perception is an iterative, self-modifying process. But, having the schemata with which to pick up information does not mean that one does so: one selectively attends to particular stimuli by anticipating the structural information it will provide. And, schemata can be structured spatially to provide a "cognitive map" (Tolman 1978) which provides a means of orienting the current perceptual learning. These cognitive maps are, in Neisser's theory, anticipatory schema which can be detached from current stimulus interaction to serve as mental images. Neiser makes the important point that mental images can interfere with perception (and vice versa).

Neisser's notion of the process of cognition, in effect, implies that competence is developed through a continuous process, and that it is a very individualistic process. His argument would, on the face of it, deny the plausibility of establishing competence standards for a program or profession. However, Neisser suggests that culturally-derived schemata mediate the psychological schemata and behavior to effect a level of social predictability; i.e., standards of competence.

Information processing theories have been criticized for not explaining how knowledge is translated into action, for ignoring motivational determinants of the acquisition and utilization of information, and for not addressing the effect of social contexts on particular cognitive styles (Rosenthal and Zimmerman 1978). The theory of social learning, first proposed by Bandura (1962), offers a general theory which bridges behavioral and cognitive psychology.

The social nature of learning

Historically, psychological theory attempted to explain human behavior as either being sub-consciously determined by needs, drives and impulses; or, resulting from stimulus conditions that evoke it and reinforcing conditions that maintain it. More recently it has been proposed that neither exclusive theory is adequate; rather, that behavior results from the interactions of individuals and conditions.

Bandura (1965) concluded not unlike Neisser, that cognition is a reciprocal interactive process, where acquired concepts influence attention to stimuli and are, in turn, modified by what is perceived. He also concluded that performance is affected by one's conception about the schedule and meaning of its consequences, which in turn alters one's conception. In other words, social learning theory proposes that behavior is cognitively mediated.

The central theme of social learning theory is that <u>most</u> learning is done <u>vicariously</u>, by observing others' behavior and its consequences. Observation provides an integrated pattern of the behavior, and thus is a more effective and efficient learning process than having to induce the pattern from trial and error. Verbal and imagined symbols preserve the experiences in representational form for future reference. It is assumed that the individual can exercise control over his/her behavior through self-regulation, by such activites as organizing the situation, developing personal performance standards, evaluating and rewarding oneself, designing self-incentives, seeking supportive models, etc.

Rosenthal and Zimmerman (1972) have shown than new learning can occur from observation alone (without performance), but that such learning is enhanced if the model or someone else offers a verbal codification of the modeled behavior. Further, the learning effectiveness is affected by the quality of the model's verbal presentation, and by the observer's awareness and cognitive set. In order for observational data to be useful, it must be perceived and attended, cognized and stored, and reviewed and re-interpreted into a personalized refined cognitive map by the observer. In a more recent review of the literature on social learning theory, Rosenthal and Zimmerman (1978) point up the complex nature of the process by which cognition is socially constructed and the implications for instruction this complexity poses. The following generalizations are drawn from their discussion of extant research:

1. Overt activity (practice), even with positive reinforcement, is generally less helpful in acquiring and retaining both concepts and complex response patterns than is observation. Apparently modeled activity alerts the observer to relevant features of the task and helps them to exclude irrelevancies, thus simplifying the problem-solving alternatives.

2. Attention to modeled behavior can be distracted if the observational context is distressing, seems unrelated to personal needs or must compete with other distractions.

3. In order to form abstract conceptualizations, the learner must be able to isolate the relevant aspects of the events and then group them into useful categories. But once learners derive a general principle it can be applied to new examples without serious performance loss.

4. Superior concept learning does not necessarily produce better transfer and retention. Rather it seems, that greater intitial learning will be preserved only if it is converted into meaningful and stable symbolic representations to guide application, which in turn influence the cognitive processing of new content.

5. Observational data that are personally meaningful are easily apprehended. The learner's biases in selecting features of input dictate priority for information processing. When personally salient attributes of the stimulus data are present problem solving is greatly simplified, but biases can impede solutions by reducing concern with certain pertinent categories of data.

6. Adequate conceptual rules for structuring information integrates and preserves knowledge economically, but imperfect and tentative principles serve as temporary guides until new information forces revision.

7. Basic rules are probably best taught under conditions that do not strain comprehension; but once basic rules are learned, transfer of knowledge to novel situations is enhanced if heterogeneity and marginal cases are encountered. Chances to make and correct errors from practice with taxing examples can prepare learners for the imperfect structuring and borderline cases of natural settings.

8. Abstract decision rules for a wide variety of moral, perceptual and cognitive judgments can be acquired and modified through modeling.

9. Expectations of rewards and punishments are not necessary for observational learning; however, if tasks are boring or arduous or tax the individual's information processing capacity, violate social mores, or compete with other diversions, incentives can enhance attention.

Vygotsky's (1976) research on child development revealed three themes that may have important implications for competence-based education:

1. Higher psychological functioning (conceptual behavior) appears first on the social plane and only later at the individual (psychological) level. That is, the child is first dependent upon the adult to organize subskills into higher order cognitive activity. Gradually, through guided learning, control of the conceptual activity shifts to the child.

2. Children have two levels of development: an actual developmental level, as measured by independent

> performance in problems solving; and potential developmental level, as judged by problem solving performance guided by more capable persons. A zone of proximal development, the distance between the actual and potential development, defines those functions which have not matured but are in the process of maturation. It is those developing functions that teaching strategies should address.

3. Learner behavior must be analyzed in terms of learner's own definition of the situation and his or her goals and subgoals.

Stone and Daly (1980) recently examined learning theory research in light of Vygotsky's notions, concluding that theories of learning need to separate "competence" models from "performance" models. They argue that traditional structuralist theory falters when it attempts to use competence (the ability to perform particular cognitive processes such as engaging in hypothetico-deductive thought according to logical rules), to describe the specific criteria for performance, such as solving real problems. They point out that it is erroneous to conclude that because the learner arrived at the "right" conclusion he/she used the cognitive rules implied by Piagetian theory. They argue that Vygotsky's process model of cognitive development helps to make the distinction between competence and performance.

Salmon (1980) poignantly summarized the limitations of psychological theories of cognition and behavior. They fail, she argues, precisely because they are separate theories; thus, they fail to explain how people really "get to know" because they dichotomize essential elements of learning and behaving: thought and feeling, educational content and personal experience, knowing and being. It is Salmon's point that both educational and clinical psychology fail to take into account the very personal nature of knowing. Salmon points up the importance of the consequence of learning, as well as the special nature of both tacit and explicit knowledge:

> . . . in any field of knowledge there are always ramifications, in terms of social interests, values, and assumptions. Although these ramifications are seldom made explicit, it is they which in the end enable a person to make any kind of knowledge fully his or her own, which keep him/her from it, or which produce a sense of personal schism in what he/she knows. To know a thing is to take a certain stance toward the world, to adopt certain values and beliefs; if these run contrary to centrally held understandings or to one's own social identity, such knowledge is assimilated only at a heavy person cost.
> (1980:13)

One concludes that a conceptualization of the continuum of clinical competence development must consider both the cognitive and behavioral components of competence, and recognize the individual nature of the developmental process. On the other hand, attempts to operationalize a competence-based educational program must also consider such matters as the potency of modeling, the significance of cumulative knowledge, the biases of both tacit and explicit knowledge, and the emotional/motivational aspects of learning. Current research is elaborating the <u>description</u> of cognition and attempting to bridge cognition and behavior; yet, we still do not know <u>why</u> one learns what one learns or why one behaves as one does.

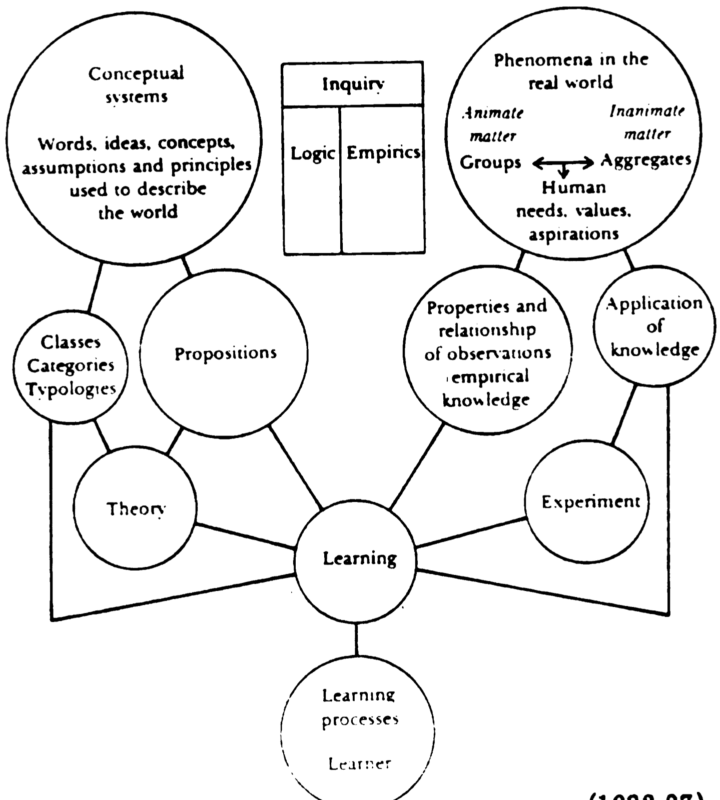
The relationship of theory to practice

Professional competence, as has been previously noted, connotes a theoretical basis of practice. The preceding discussion of information processing and social learning hint at some of the relationships of theory to practice.

The National Society for the Study of Education undertook the study of integration from the perspective of educational planning. The study committee concluded that the integration of knowledge and experience is a continuous psychological process in which the individual "seeks to organize the interrelated all of his experiences in new and more meaningful ways" (Dressel 1958:251). That, of course, is what current information processing theory addresses: the psychological process by which stimuli are perceived and integrated into the existing cognitive structure.

Dressel (1981; 1982) has made the case that logical systems of thought, as represented by disciplines of study, provide a (not always sufficient) means to understanding, predicting and controlling events in the real world. The learner, according to this notion, stands mid-ground between theory (explicit knowledge) and practice (tacit knowledge), where:

Figure 1. Conceptual Systems and Reality.



(1982:87)

Dressel assumes that the learner uses (should use) the processes of the logical system to organize the data gathered from the real world, and that explicit knowledge in the form OF propositions, theory, and classification systems is used to test the empirical data so organized. And although Dressel (1981), has argued

that theoreticians and practitioners have different views (both being essential to the advancement of medicine), he does not address the psychosocial process of integrating theory into practice, and vice versa, so as to address such learning problems as reconciling differences in theory, reconciling differences in perceptions of the real world, having to perform before theoretical knowledge has been gained, etc. A conception of the philosophical relationship of theory to practice does not, in itself, anticipate the learner's phenomenological relationship of theory to practice.

Mao Tse-Tung (1953) argued that theory is dependent on (follows) practice and that social practice is the single criterion of truth. In his dialectical materialism theory of knowledge, perceptions of phenomena are gained through practice (perceptual knowledge) which, following repetition, are organized into concepts; which, in turn, are manipulated to form inferences and judgments (rational knowledge). To be complete, however, a theory must in turn actively change the external world. In fact, unless the theory achieves the anticipated results in practice, it is not truth. In this dialectic, practice (perceptual knowledge) changes and is changed by theory (rational knowledge), which is, in turn, changed by and changes practice. Mao does conclude, not unlike cognitive scientists, that things merely perceived cannot be readily understood, and that only things understood can be profoundly perceived. This reciprocal relationship between perceiving and knowing results in a historic, as well as social, definition of truth.

Mao's conception of the relationship of theory to practice provides a way of conceptualizing the phenomena of cognitive development and understanding individual differences in constructions of reality. One might anticipate, for instance that "truth" would be defined differently for someone with limited experience than for someone with extensive experience. Mao's conception also firmly anchors explicit knowledge in the phenomenological world thus emphasizing the social construction of knowledge.[1]

Summary

An interesting point to contemplate is how a learner, whose knowledge is theoretical, accommodates practice which does not conform to the principles of theory: and, vice versa, how the student who has had extensive practical experience receives theoretical knowledge which is inconsistent with his/her experience. The above discussions of learning might suggest that in either instance, the learner would perceive what can be anticipated by existing knowledge and not perceive other data. The learner in either case operates from "theory," in the first case from "pre-integrated" theory, and in the second case from 'generated' theory. These theoretical bases, schemata, would appear to be powerful controllers and facilitators of learning.

It, then, must be concluded that life experience is as powerful a promoter of learning as is schooling (social learning theorists and dialectic materialists might argue it is a more powerful). If that is true, medical students with extensive life experience and experience in medically-related occupations should be expected to learn different things at a given point the curriculum; and in different ways from those with limited experience. It would further seem that role models would be important facilitators of learning for osteopathic medical students. Social learning theory would have us conclude that, in fact, modeling is a more powerful learning

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1 For a comprehensive discussion of the historic process of the social construction of reality see Berger and Luckmann, The Social Construction of Reality, 1966. See Dubin, Theory Building, 1978, for further epistemological discussions of the relationship of theory to practice.

facilitator than is either practice or didactic presentation. Not only do models facilitate the students' development of efficient cognitive structures for processing information for task performance, but they guide the development of rules for making moral as well as perceptual and cognitive decisions; i.e., they guide the integration of theory and practice.

This discussion of learning theory thus supports the notion of a continuum of learning and, in the case at hand, a continuum of clinical competence development, since increasing knowledge increases perceptual acuity, which, in turn, increases the amount of information gained from the environment.

Medical Education and Physician Competence

Medical education, as decribed in Chapter I, has during the last several decades undergone a public and private assessment no less critical than that reported in the famous 1910 Flexner report. In contrast to Flexner, who evaluated educational programs on the basis of their content, structure and resources, contemporary critics have evaluated medical education programs on the basis of their product: the performance of graduates and the health status of the public. Medical educators have had to shift their focus from what faculty teach to what students learn and do. Advocates of medical reform have argued for significant changes in the delivery of health care--changes which have implications for significant changes in medical education. In effect, there has been a shift in the public conception of competence in medical care.

This section will review literature which highlights the changing themes in competency-based osteopathic medical education: defining professional competence, evaluating competence, and structuring programs to develop competence.

Defining Professional Competence

From the sociological perspective the professions have been given special responsibility (and authority) to preserve the central social values: life, death, justice and the continuity of society itself (Olmsted undated). This stewardship implies that members of a profession have particular knowledge and skills. According to Olmsted, "what sets professional work apart from other work is . . . that the special knowledge of the profession is built on an understanding of the underlying theory" (p. 3). Competence from this perspective is defined in terms of knowing the system of knowledge of the profession. Logically, then, medical curricula would be structured to teach that body of knowledge, and students who have successfully completed such a study would be considered to be competent.

National and state boards of examiners have, since Flexner's time, assumed responsibility for assuring the competence of medical practitioners; i.e., assuring that they have completed proper programs of study and have mastered the subject matter. The classical testing modalities employed by the various certifying agencies were the essay examination and bedside oral examination conducted by "expert" physicians. In fairly recent years, psychometric issues of reliability of the evaluations--not the professional concerns of validity--were raised which resulted in the elimination of the bedside examinations (Hubbard 1971). Since that time, boards of examiners have pursued efforts to develop psychometrically sound tests which measure clinical competence as well as knowledge of the medical sciences. Defining clinical competence was, and continues to be, the single most difficult problem. The greatest impediment to defining clinical competence has been the lack of consensus on what constitutes a good physician. As Senior succinctly summarized the dilemma:

> Unless we are willing to accept the definition of a good doctor as one who has a certain number of years of training in a given environment, or one who scores high on written tests of his medical knowldge, or even as one whose peers, superiors, juniors, or patients think well of him, then we are obliged to press ahead to define the good physician in terms of one who performs well . . . The nub of the matter is . . . that there is no applicable body of rational theory to apply for the measurement of competence.
> (1976:15, 16)

There are two problems, describing competence and measuring it, both of which are attended by theoretical and practical limitations. Those limitations are made most clear in studies which persistently show NO more than a chance relationship between admission criteria or medical school grades and professional performance criteria (Price et al 1971; Wingard and Williamson 1973; Bunda and Saunder 1979).

Defining competence as clinical performance: Numerous studies have been undertaken to describe the characteristics of physicians and/or their work (Price et al 1963, 1971; Bergman 1966, 1969; Sanazaro and Williamson 1968, 1970; Kroeger 1968; Yankauer 1969, 1972; Mechanic 1972, 1975), using a variety of methods of analysis: self reports, observation, task analysis, critical incidents, expert judgment, public health statistics, medical review (McGaghie 1978).

The earliest attempts to describe medical competence based on professional task analyses were motivated by medical specialties' needs for means of certification and re-certification (Chapman 1978). The first such definitions of competence, such as the one resulting from the National Board of Medical Examiners' 1960 study, were unidimensional descriptions of the physician's tasks. Only a limited effort was made to clarify the tasks, as seen by this NBME list:

I. History:
   A. Obtaining information from patient.
   B. Obtaining information from other sources.
   C. Using judgment.

II. Physical Examination:
   A. Performing thorough physical examination.
   B. Noting manifest signs.
   C. Using appropriate technique.

III. Tests and Procedures:
   A. Utilizing appropriate tests and procedures.
   B. Modifying test methods correctly.
   C. Modifying tests to meet the patient's needs.
   D. Interpreting test results.

IV. Diagnostic Acumen:
   A. Recognizing causes.
   B. Exploring condition thoroughly.
   C. Arriving at a reasonable differential diagnosis.

V. Treatment:
   A. Instituting the appropriate type of treatment.
   B. Deciding on the immediacy of the need for therapy.
   C. Judging the appropriate extent of treatment.

VI. Judgment and Skill in Implementing Care:
   A. Making necessary preparations.
   B. Using correct methods and procedures.
   C. Performing manual techniques properly.
   D. Adapting method to special procedure.

VII. Continuing Care:
   A. Following patient's progress.
   B. Modifying treatment appropriately.
   C. Planning effective follow-up care.

VIII. Physician-Patient Relationship:
   A. Establishing rapport with the patient.
   B. Relieving tensions.
   C. Improving patient cooperation.

IX. Responsibilities as a Physician:
   A. For the welfare of the patient.
   B. For the hospital.
   C. For the health of the community.
   D. For the medical profession.

More recently, multi-dimensional definitions of medical competence have been designed. These definitions include the abilities (knowledge, psychomotor skills and affect) thought requisite to performing generic tasks, such as gathering, organizing and recording data. The 1974 statement of the American Board of Pediatrics represents this type of competence statement.

Lloyd (1979) pointed out that these competence statements have generally been unused despite their having resulted from major research efforts by the respective specialty boards.[2] But more important to the current discussion is the fact that the descriptions were developed to describe the mature practitioner and intended to be used for board certification.

In their most recent effort to conceptualize competence in medicine, Burg and Lloyd (1979), following the National Board of Medical Examiners model, proposed two components of competence: tasks and clinical situations. They define tasks as those functions that a physician must perform in providing care to his/her patients which include:

1. History taking
2. Physical examination
3. Use of laboratory tests, roetgenography and other investigative techniques
4. Defining clinical problems
5. Management
6. Record keeping
7. Employing special sources of information
8. Monitoring health status;

and which require five basic abilities and behaviors:

a. Knowledge/understanding
b. Problem solving/clinical judgment
c. Attitude/work habits
d. Interpersonal skills
e. Technical skills

The other component of competence, clinical stituations, is considered to be the subject matter of the clinical specialty, and is divided into two major categories of clinical situations: information related to well patient care and information related to caring for ill patients. From this conceptualization one can integrate the tasks and clinical situations into a matrix to guide the development of specific statements and criteria for competence:

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2 Descriptions of the studies undertaken by the various specialty boards (Orthopedic Surgery, Nuclear Medicine, Pediatrics, Obstetrics and Gynecology, Child Psychiatry, Thoracic Surgery and Internal Medicine) and addresses for obtaining copies of the competence statements are offered in the American Board of Medical Specialties Conference Proceedings, September 19, 1979: Definitions of Competence in Specialties of Medicine.

TASKS- Abilities/Behaviors	Problems of Ill Patients		Health Maintenance Situations	
	1	2 etc.	1	2 etc.
History Taking- Knowledge, Problem solving, Attitudes, Interpersonal, Technical				
Physical Examination- Knowledge, Problem solving, Attitudes, Interpersonal, Technical				
Use of Laboratory Tests, etc.- Knowledge, Problem solving, Attitudes, Interpersonal, Technical				
Defining Problem(s)- Knowledge, Problem solving, Attitudes, Interpersonal, Technical				
Management- etc.				

(American Board of Medical Specialties 1979:24)

Rather than attempt to state the subject matter for every clinical situation, they suggest that examples of important diseases or health maintenance activities could serve as representative samples for the domain.

The Lloyd and Burg model takes into account the important issue of the context of the clinical problem, an issue which heretofore had not been considered in medical competence models, but provides little guidance in operationalizing the concept. LaDuca, et al (1975) developed a performance situation model to select training objectives for several allied health occupations which provides such a guide. The LaDuca model proposes a three dimensional universe for inventoring the clinical problems that can be encountered by the professional: the client, the problem, the setting. From this inventory, clinical situations are selected which have the highest priority, thus eliminating rarely encountered problems and unnecessary duplication of learning experiences. Then for each critical training situation the professional tasks to be performed are specified.

Together the Lloyd and Burg, and LeDuca models provide a promising place to start to define a performance model for physician competence. For example, existing inventories of cases managed by physicians in general practice (Bergman 1969; Baker 1978; Kroeger 1978; Weinberger 1976; Golden 1976; HEW 1978) could provide the universe from which to select the critical cases to be elucidated by the performance situation model. The Lloyd and Burg matrix could then guide the definition of abilities for each of the tasks associated with the clinical situation. Thus, by combining the two models, the limitations of each could be minimized. For example, the Lloyd and Burg model uses "ill patient" and "health maintenance situation" to dichotomize the situational context, which is insufficient to distinguish the problem solving, available resources and management strategies that would be expected of the physician managing, for example, upper respiratory infection (URI) cases. It can be envisioned that a child with a URI seen as an out patient in early stages of the infection would be managed very differently than if that child required hospitalization because of complications. One might also envision that a physician whose philosophy included the limited use of hospitalization and extensive use of alternative therapeutic modalities, might consider very different management strategies from a physician whose philosophy endorsed rigorous drug therapy and use of hospital staff to provide the therapy.[3] The LaDuca model also provides a means of analyzing psychosocial and physical dysfunctions that can be associated with a particular clinical situation, an

3 Ms. Wendy Page-Echols, a third-year osteopathic medical student, is credited with having provided this insight into the complex nature of the construct 'context' by describing differing approaches to management of these kinds of cases.

elucidation which should be particularly accommodating for the wholistic philosophy of osteopathic medicine. On the other hand, the Lloyd and Burg model elaborates the abilities and behaviors essential to performing the specific professional tasks required of the selected clinical situation.

Jason (1979) cautioned that statements of competence should comply with standards of clarity, importance, difficulty and pertinence to outcomes. He proposed the following checklist by which to evaluate statements:

1. Is it clear what the Candidate needs?
   . to me? . to others? . to the Candidate?
2. Is it clear why the Candidate needs this competence?
   . to me? . to others?
   . how do I know? . how sure am I?
3. How regularly will the Candidate need this competence?
4. Under what conditions will the Candidate need this competence?
5. What are the consequences of the Candidate not having this competence?

(1979:28)

In answering these questions one must, as Jason points out, consider the principles of learning previously outlined. For example, knowing something (competence) is bound to the situation in which it is learned; hence, knowledge gained in didactic courses isolated from the clinical setting is not readily translated to clinical problem solving and is, therefore, not necessarily a clinical competence.

Defining competence as clinical judgment: When n the 1950's and '60's, certification examinations were criticized for their subjectivity and lack of reliability, efforts were made to devise objective tests of competence. One definition OF clinical competence was "taken to mean using knowledge to solve problems (Senior 1976:16).[4] In an extensive study undertaken by the National

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4 See Elstein, Shulman and Sprafka, Medical Problem Solving, for a discussion of the theoretical and methodological issues of medical problem solving and their implications for medical education.

Board of Medical Examiners and the American Board of Internal Medicine it was shown that computer-based clinical management cases provide a means of offering all examinees equivalent tests and testing conditions, of objectively and reliably scoring tests results and of analyzing the examinees clinical problem solving styles (Senior 1976). It also revealed that partially and fully-trained medical personnel (medical students and internists) could be distinguished on the basis of their clinical work-up style. This extensive study concluded, among other things, that knowledge is necessary but not sufficient for medical problem solving competence, which, in turn, is necessary but not sufficient for good performance in practice.

Evaluating Competence in the Clinical Setting

Despite vigorious efforts in the last several decades to improve educator's evaluation skills, to improve testing instruments, and to refine models of evaluation, evaluation of medical students in the clinical setting has remained a troublesome business. The single most important factor contributing to the problem is the insufficiency of definitions of competence. As Samph and Templeton (1979), have argued, definitions of competence and availability of reliable methods of evaluating competence are inextricably interwoven. Concerns for psychometric issues (particularly reliability) have shaped the kinds of testing done and, thus, the definitions of competence. For example, as was noted above, the National Board of Examiners defined professional competence in terms of clinical judgment, which lent itself to objective and reliable tesing. Evaluating performance, however, has been more difficult. Samph and Templeton conclude that important aspects of professional competence, previously ignored through objective evaluation mechanisms, or assumed to have been reliably assessed in clinical training, will in the future have to be defined and evaluated by medical schools, if for no other reason than legal challenges to current certifying procedures. Demonstrating validity of indirect measures of professional ability and performance, they say, will continue to pose the greatest challenge.

A second, and related, contributing factor is the lack of standards for the competencies that are described. Reported studies of clinical evaluation have typically employed either: normative rating scales, where the student's performance is judged in one of a number of ways as "above average," "average," or "below average;" or criterion-referenced check lists, where specific behaviors are reported as being present or absent. Attending this problem is the lack of definition of reasonable expectations of students at various levels of training. While differences in ability to solve clinical problems have been shown for individuals at various levels of professional training (Senior 1976; Mazzuca, Cohen and Clark, 1981; Elstein, Shulman and Sprafka 1976) there still remains little qualitative information by which to guide the establishment of standards of performance for students at different levels of medical education. And without such standards evaluators are left to their own judgments as to what is 'average' or what is reasonable for a student to omit or comit in his/her performance.

Another significant problem in clinical evaluation is the variability of testing conditions and ratings. Clinical situations differ for each student, making it difficult if not impossible to establish equivalent testing conditions for all students in a given clinical situation or in a given class. Field studies in clinical settings of students' reactions to their experiences and descriptions of their typical clinical performance (Schermerhorn 1979; Sachoff 1979; Gordon et al 1977) point up the problems of sampling attendant in measurement techniques using structured clinical performance examination and the artificiality of such techniques. More recent efforts have been made to combine the realism of the qualitative (field evaluation) studies with the higher reliability of the measurement techniques; videotaping, in particular, has proved effective, though costly (Liu, Miller and Herr

1980). As was noted previously, the context of clinical performance is a critical variable in determining what should be performed and how students do perform; thus, the criteria for performance must to some extent be situation specific. It has also been shown that clinicians use idiosyncratic bases for judgments and, hence, reliable clinical evaluations are difficult to obtain (Littlefield et al 1981). It is time-consuming and costly to adequately sample students' clinical performances and to assess them reliably.

Yet another problem has been the difficulty in determining the validity of clinical performance standards. Some studies have approached the question of the validity of performance ratings by attempting to correlate them with other measures such as the written and oral cognitive examinations. This has proved to be an unproductive approach, resulting in the conclusion that performance ratings measure abilities significantly different from those measured in cognitive assessments (Willoughby, Gammon and Jonas 1979). Even fewer studies have undertaken to test the validity of training objectives. One such study was unable to justify the inclusion of interviewing skills in medical training, since interviewing skills were not significantly correlated with problem solving, data collection, or problem identification (Brockway 1979)! And Greenland et al (1979) showed that increased knowledge of diagnostic test characteristics correlates poorly with increased selectivity of use of those tests in the diagnostic process. More important than raising questions about training to be included in the medical curriculum, these studies point out the complex problems attending defining and measuring competence. Brockway raises another important evaluation issue: credibility. She points out that unless evaluation is seen to be relevant and valid, it will be perceived as a hurdle rather than as a benefit to the learner.

One thing is clear from the studies of evaluation of clinical performance: no single testing mechanism is sufficient (Slotnick and Grey 1978; Samph and Templeton 1979; Harden 1979; Brockway 1981).

Designing clinical evaluation systems: Evaluation begins from a philosophical view of both education and evaluation. What and how one evaluates depends on what one intends students be able to do and what one intends to do with the results of the evaluation (Morgan and Irby 1978; Zinser *et al* 1979; Dressel 1978, 1981). Traditionally student evaluation has focused on measuring what students are able to do in order to certify their successful (or unsuccessful) completion of a course of study. In recent years medical schools have endorsed the teaching-by-objectives approach to instruction, which, in turn, has encouraged evaluation-by-objectives. While this approach, in theory, allows for evaluation of instructional process as well as student achievement, it has exhibited operational weaknesses: the objectives frequently are written to accommodate measurement tools rather than to reflect the intent of the course or program; objectives tend to be individual faculty course objectives, which cumulatively may or may not adequately reflect the program goals and objectives; and evaluation tends to be a terminal process rather than providing faculty, students and administrators with on-going information by which to adjust instruction and learning (Guba 1969).

Jason and Westberg take the position that evaluation in the health professions has such important social and psychological consequences that it must be conducted through a democratic process. Evaluation, they say, should provide "trustable answers to worthy questions" (1978:23) posed by students, faculty, administrators, and the public. Their examples of questions are useful to consider.

STUDENTS:

-- "How much promise do I have as a health professional?"
-- "How effective a learner am I?"
-- "How should I modify my learning efforts at this time?"

FACULTY:	-- "How effective an instructor am I?"
	-- "How should I modify my current efforts in behalf of my students?"
	-- "How successful was my course/ program in preparing my students for their careers?"
ADMINISTRATORS:	-- "How effective is our college/ department in preparing our students for their careers?"
	-- "How can we improve upon what we are now doing?"
PUBLIC:	-- "How well prepared are the graduates of this program to provide what society most needs?"
	-- "How efficiently has the program used the resources society has provided?

(1978:23)

Jason and Westberg make the important point that the typical evaluation mechanism in medical school, content-oriented examinations which make demands on fairly low level, passive, intellectual skills, are counter-productive to developing independent learners who are critical thinkers and skilled problem solvers. Also contributing to this failure to develop independent learners is the lack of a self-evaluation component of the evaluation system (Jason and Westberg 1978; Fuhrmann and Weissburg 1978).

Ultimately the evaluation system elected and designed for a program depends on the philosophy, resources (money, time, and personnel), and receptivity of the academic community.[5] The evaluation system can be designed to focus at any

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5 Descriptions and typologies of theoretical models of evaluation can be found in numerous texts. See for example: Worthen and Sanders 1973; Anderson and Ball 1978; House 1979; Patton 1981.

aspect of the program, or the entire program; and be intended to provide on-going information for program planning purposes, such as the model proposed for osteopathic medical education by Dressel (1981); provide comprehensive information about students' clinical competence, such as the models outlined by Harden (1979), and Graham (1971); or describe the student performance and instructional process in the clinical setting, such as the model developed by Gordon, Hadac and Smith (1977).

Structuring Medical Education Programs for Competency Development

Medical education program planners historically have employed one of several curriculum models and have used various rationales for the sequencing of curriculum content (courses).

Curriculum Models for Medical Education

Medical education programs have traditionally been subject-centered. In the traditional curriculum model, the first several years of the program consist of a series ofdiscrete courses representing the science disciplines throught essential to gaining the theoretical basis of medical practice, such as anatomy, biochemistry, physiology, pathology, pharmacology, microbiology, biostatistics and embryology. The next several years consist of analogous discrete courses (rotations) in the clinical disciplines, such as gynecology, obstetrics, pediatrics, surgery, hematology and psychiatry. An implicit assumption of this model of medical education is, not only that students become 'competent' in the disciplines as a result of such course work, but that students can and do apply the theory in practice. McGaghie et al (1979) contended that such programs have certain undesirable consequences for medical students and their future patients by:

- emphasizing factual knowledge of independent disciplines;
- limiting students to the same education, ignoring individual differences;
- attending to less common clinical problems;
- implicitly focusing on human disease rather than emphasizing health; and
- promoting insularity of the disciplines and their practitioners.

A curriculum model which emerged in the 1950's through the pioneering efforts of Case Western Reserve Medical School emphasizes the integration of the disciplines around a topic, such as an organ system (Sinclair 1972). In its ideal implementation clinical experiences are concurrent with the integrated didactic course work. This model assumes that learning has greater meaning and retention is increased if didactic and experiential learning are concurrent. The integrated curriculum model has obvious advantages over the subject-centered model; it does not, however insure that theory is integrated into practice, since the emphasis remains on developing cognitive competence in the theory undergirding practice.

Only recently has there appeared in the medical education literature discussion proposing competence-based medical education (Hamilton 1976; Weed 1976; McGaghie et al 1979; Barondess 1981). And only one monograph was found which formulated an approach to designing competency-based medical education (CBME), the World Health Organization monograph edited by McGaghie _et al_. The curriculum model proposed in this monograph subscribes to the elements of CBE previously described:

- the curriculum is organized around _functions_ required for the practice of medicine in a specified setting;
- instruction is based on the principles of mastery learning; i.e., entry level testing, stepwise instruction, flexibile time scheduling, and frequent assessment.

These authors advocate a situation-specific definition of physician competence. That is, a definition of competence for physicians intending to practice in developing nations, they argue, is likely very different from one for physicians intending to practice in technologically sophisticated settings. It should be added that the philosophy of medicine upon which the educational program is based should also direct the definition of competence (Dressel 1983). That is, when attempting to design a competency-based osteopathic medical education program, one must first describe the nature of the professional role of the osteopathic physician in the practice setting of the graduates. To date few studies of osteopathic physicians and their practice have been conducted, although helpful statistics which distinguish M.D.s and D.O.s appear to be emerging from the National Center for Health Statistics.[6]

Structuring Competency-Based Medical Education

McGaghie et al (1979) report that there is no evidence of an optimal sequence of courses for the traditional curriculum models, nor is there any convincing evidence that early courses are prerequisite to those that follow since there is such rapid decay of unused knowledge.

Posner and Strike (1974, 1976) proposed that curriculum structure can be analyzed at two levels: (1) the extent of relationships among intended learning outcomes, and (2) the kinds of relationships between curriculum elements. They categorize the kinds of structuring criteria used in curriculum designs as follows:

1. World-related. What are the empirically verifiable relationships between the phenomena (people, things or events) in the world about which the pupil is to learn and how can the curriculum be sequenced so that the organization is consistent with the way the world is?

2. Concept-related. What are the conceptual properties of the knowledge which the pupil is to learn and how can the curriculum be sequenced so that it is logically consistent in organization to the organization of the concepts?

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6 See for example: Koch, H. "Office Visits to Doctors of Osteopathy: National Ambulatory Medical Survey United States, 1975. DHEW, 1978, and Cypress, B.K. Characteristics of Physician Visits for Back Syndrome: A National Perspective. American Journal fo Public Health 73(4):389-395, April 1983.

3. Inquiry-related. How are knowledge claims produced and how can the curriculum be sequenced so that it is consistent with this process of inquiry?

4. Learning theory-related. How does the pupil learn and how can the curriculum content be sequenced to provide for optimal learning efficiency, retention, and transfer?

5. Utilization-related. How will the pupil utilize the curriculum content after he has learned it and how can the content be sequenced so that it is consistent with the utilization process?

(1974:5,6)

Dressel (1980) takes the view that the structure of curriculum has reflected the territorial interests of departments and presumptions about the essentiality and transferrability of knowledge of the disciplines. He points up the arbitrariness and interrelatedness of curriculum structure and content, and their impact on student motivation and learning. It is his opinion that "the traditional departmental disciplinary orientation to the development of education has made it very difficult to establish new structures and to relate structure, content and the interaction involved among these to their effectiveness in producing or stimulating growth toward broader and more enduring behavioral objectives" (Dressel 1980:23). He concludes that the structure of the curriculum has traditionally been determined by utilitarian considerations rather than by those considerations intrinsic to the learning process or what is to be learned.

Armstrong (1977) has highlighted the importance of the structure of the curriculum itself, suggesting that inherent in the traditional medical curriculum of pre-clinical and clinical courses is a disease-oriented perspective--a point which may be of particular concern to osteopathic medical educators. He concludes that the structure and content of traditional curricula ensures that medical students develop a "clinical gaze" that corresponds to hospital work and not to that of primary care. He argues that the pre-clinical courses emphasize reductionism, reformulation (not explanation) of the phenomenon, acquisition of states of knowledge, and controlled and bounded knowledge; which are inconsistent with the nature of clinical work characterized by openness, knowing <u>how</u> knowledge is created, and abstract and implicitly controlled knowledge. The common integrator for these dichotomous conceptions of knowledge, Armstrong contends, is <u>disease</u>. Thus, the student comes to see "the task of diagnosis as essentially the approximation of the patient's pathology to an established disease category" (1977:246).

Administrators of professional educational programs have, as Dressel has pointed out, a social obligation to ensure "that each individual undergoing a professional program be held to reasonably well defined and acceptable standards" (1979:4). Dressel has outlined six sequential steps for developing an osteopathic medical education program:

(1) definition of the purposes of a college of osteopathic medicine and of any unique purposes of a particular college;

(2) a statement of educational objectives, such that their attainment at or above a specified level indicates attainments deserving recognition by conferring the D.O. degree;

(3) develop a continuous sequential, integrative, and individually adaptable set of experiences including:

- formal courses in basic and clinical sciences,
- clinical experiences,
- discussions of professional, ethical, social, and philosophical problems, issues, and obligations,
- continuing, constructive, and developmental individual evaluation;

(4) conduct continuing or recurrent evaluation of individual faculty members to ascertain the extent of understanding of, commitment to, and performance in particular phases of the program in appropriate relation to the desired composite student experience;

(5) conduct continuing or recurrent evaluation of the program <u>and</u> of its composite impact on student attitudes, values, knowledge, and developing porfessional competencey;

(6) adjust and modify the program in reference to continuing changes and accumulation of knowledge about health and maintenance of it, improved technology and expanded range of health care technicians and specialists, changing social expectations and demands, new insights into learning and means of motivating and expediting it, change in and hence continuing need for orientation of new students and faculty.

(1981:2,3)

The model proposed by McGaghie et al (1979) follows the classical principles of mastery learning with the important exception that they appear not to ascribe to the notion of hierarchical learning espoused in early mastery learning theory. The sequencing principle they propose is consistent with the Posner and Strike utilization-related principle, in that they propose that modules be arranged so as to facilitate the student's mastery of essential problem solving competence. Specifically, they propose that:

First, a clear and precise listing of the components of competence be prepared;

Second, components (units) are clustered into logical patterns related to the problem solving competence;

Third, each component be developed into a self-contained instructional unit;

Fourth, students proceed through the units at their own pace;

Fifth, the sequence in which the instructional units are undertaken is determined by the individual student; and

Sixth, criteria be established by which competence is measured.

McGaghie et al point out that expectations (standards) for student performance should realistically reflect the student's level of training and accumulating effect of training on competence, by establishing minimum criteria for performance at critical points in the training program. Evaluations, in their curriculum model, are intended to be used primarily to guide the professional development of the student. Assuming that standards of performance are clearly defined, the final judgment can only conclude that the function is mastered, for if it is not, instruction and learning (and evaluation) continue until mastery is achieved.

The examples provided by the authors to illustrate the mastery approach do not come from medical education programs nor from programs in which the clinical facilities are geographically removed from the educational institution, as would be the case with community-based medical education programs. Also, the authors provide no guidance with regard to the practical problems of limited resources (time and faculty) in managing an ideal mastery learning program. They do, however, point out that CBME programs will significantly alter the institution's operation and must be undertaken as an experiment in change. Teachers, they argue, will have to undertake new roles such as planning CBE strategies, managing instructional resources, and conducting diagnostic evaluations; while students will have to abandon their adversarial position toward curriculum, and accept personal responsibility for learning.

McGaghie et al describe the three strategies most frequently employed to effect curriculum/organizational change and some of their consequences:

1. Power: The person or persons (dean, department chairs, for example) with primary authority in the program identify a program goal and mobilize the resources to put the new program into effect. The change can be effected in a relatively short period of time; however, it may not be long lived. Ultimately it is the faculty who implement and sustain change and without their understanding and commitment to the new program it is likely not to be sustained.

2. Rationality: A change is hypothesized and an investigation is undertaken through which a rational proposal, complete with supporting data and data on alternatives, is developed and presented for discussion. While this method should appeal to academics it generally does not, because it does not deal with the special interests and psychological needs of faculty and students.

3. Re-education: Change is effected through systematic organizational efforts which will enhance changes in values, skills, and political realignments, as well as in knowledge of the intended change. This approach is frustratingly slow and can easily be sidetracked by conflicting priorities and territoriality, but it can be enhanced by rewarding teaching and education research.

Summary

Certain conclusions can be drawn from this cursory review of the literature. First, definitions of medical competence have been varied but have typically they focused either on knowledge, in the sense of having the capacity to do something, or performance, in the sense of taking appropriate actions in the performance of professional duties. Recently proposed conceptual models can guide the development of competence statements which include both ability and behavioral components and which define the environmental context for the competence. To date, the descriptions of medical competence have described professional level competence: most prevalant are descriptions of specialty level competence (completion of residency training). Evidence from studies of both knowledge and performance certifying exams suggests that cummulative knowledge and the practice situation affect competence. Implicit, but not explicitly stated, in the models for defining competence is the importance of the philosophy of medicine by which the training program is guided.

Second, availability of conceptual and methodological tools for evaluation has to a considerable extent dictated definitions of competence. The recent emphasis on performance outcomes of medical education requires consideration of validity, as well as reliability issues, in evaluation and program content. Multiple approaches to evaluation will be necessary in order to effectively determine cognitive, psychomotor and affective aspects of professional competence. It will also be necessary to define reasonable competence standards for students at various stages of training in the pre-professional level.

And, finally, designing educational programs to facilitate development of professional competence requires new perspectives and skills on the part of all members of the academic community. Any attempt to change from a traditional curriculum model to a CBME model will be hampered by the lack of operationalized models and institutionalized resistance to change. Educators can expect difficulties when attempting to design and manage a non-traditional curriculum. Discipline-focused courses, use of discipline experts as faculty, and faculty/discipline autonomy are strong traditions in academia, paralleled by the traditions of specialty-oriented services, use of specialist and subspecialist consultants, and attending physician autonomy in hospital-based patient care. These traditions are woven into the fabric of what we think of as "medical education" and "medicine." Not only is it difficult to implement change which counter these traditions, it is even more difficult to conceptualize alternatives. Without a clear understanding of the processes and effects of the current curriculum, proposed changes are likely to be ignored or co-opted. And without such insights it will be difficult to propose changes which truly reflect an alternative. Having envisioned and designed and even operationalized a non-traditional curriculum, however, does not ensure its long life.

Summary

This chapter has reviewed selected literature which points up the critical issues in competence-based education. The review of literature related to the general concepts of CBE pointed up the diversity of views and the central importance of philosophy in determining what one thinks "competence," "competency-based education," and "evaluation of competence" mean.

The review of basic concepts of learning theory presented some issues which are thought particularly pertinent to medical education and to conceptualizing a continuum of clinical competence development: how information is perceived, how one selects and attributes meaning to information, the social process of learning and defining reality, and the relationship of theory to practice.

The brief review of the medical literature focused on how professional competence has been defined and evaluated, and how educational programs have been and can be structured, depending upon the planners' notion of competence.

CHAPTER III

METHODOLOGY

This chapter outlines the methods used to address the problem outlined in Chapter I: the need to elucidate the process by which osteopathic medical students acquire professional competence and to examine certain assumptions regarding competence at each of three levels of training. First, the study design and its rationale are described. Next, an overview of the content and process of the interviews is provided. And finally, the methods used to analyze the data are presented.

Study Design

This study is part of a series of studies initiated in 1974 by the Michigan State University College of Osteopathic Medicine to examine its curriculum and its relation to student professional development. A number of the studies consider students' perceptions of the program and employ the research interview methodology (Sharma 1975, 1976; J. Dressel 1977; Weaver 1980). This study continues the student interview methodology initiated by Paul L. Dressel for the study of MSU-COM. And, as with past research efforts, the study is intended to benefit curriculum administrators, students, and the profession. It is intended to be illuminary rather than critical.

The study began with the presumption that insufficient theory guides curriculum development and evaluation of so-called competence-based educational programs. It was assumed that efforts to improve planning or study of such programs could be improved by having a more thorough description of the manner in which participants are affected by the program. It has been argued that scientific inquiry must be grounded in theory inductively developed from social research (Glaser and Strauss 1967; Denzin 1978; Lofland 1971; Blumer 1969; Webb et al 1966), with Blumer describing grounded theory as:

> lying in the examination of the empirical social world. It is not to be achieved by forming and elaborating catchy theories, by devising ingenious models, by seeking to emulate the advanced procedures of the physical sciences, by adopting the newest mathematical and statistical schemes, by coining new concepts, by developing more precise quantitative techniques, or by insisting on adherence to the canons of research design.
>
> (1969:35)

The study, then, was intended to describe the phenomenon of clinical competence development of osteopathic medical students in one educational program. Its intent was to gain a better understanding of the complex nature of that developmental process, rather than to identify predictive cause and effect relationships of the variables. Specifically, it was directed towards understanding the students' perspective of what professional tasks students are able to do in the patient care setting and why. Seen from the perspective of evaluation the study was concerned with both outcomes--intended and unintended--and processes (Stufflebeam 1973; Stake 19750 Partlett and Hamilton 1976; Dressel 1981). The study used a single data base, the perceptions offered in in-depth research interviews by students who were currently completing or had just completed one of three phases of the education program.

Rationale for the Study Design

As MacDonald and Walker (1975) pointed out, curriculum evaluators are frequently faced with questions which simply do not lend themselves to conventional experimental research methods. Particularly those questions which focus on understanding the transactions in the teaching/learning milieu, they suggest, lend themselves better to descriptive methods of study.

Stake (1978), in his review of the literature, argued that the case study lends itself particularly well to extending understanding, versus, explaining. Typically the case study is a historic description of variables in their complex relationships, which is better suited to expanding one's view of the phenomenon than reducing it to a set of propositional statements. He also contends that case studies can lead to generalizations about the case under study and those similar to it. That is, "naturalistic generalization," in contrast to scientific law, is a product of experience, "from the tacit knowledge of how things are, why they are, how people feel about them and how these things are likely to be later or in other places with which this person is familiar," (1978:6). In order that such generalizations can be made about the case studies, however, it is essential that the target case be properly described and that the boundaries of the system be kept in focus.

Patton (1980), in his typology of evaluation methods, described the case method as compatible with evaluation methods intended to examine the educational processes themselves. Evaluation using the case method places the "emphasis on perception and knowing as a transactional process," (1980:54). House also contends that "one can study perceptions only by studying particular transactions in which the perceptions can be observed" (1978:9).

Similarly, Parlett and Hamilton argue that studies in order to be illuminative must be descriptive and interpretive, and concern themselves with the transactions within the milieu being studied:

> It [illuminative evaluation] aims to discover and document what it is like to be participating in the scheme, whether as a teacher or pupil, and, in addition, to discern and discuss the [program's] most significant features, recurring concomitants, and critical processes. In short, it seeks to illuminate a complex array of questions (1976:144).

Certain assumptions and a particular philosophic orientation, then, undergird this study. The assumptions underlying the study reported here are those of qualitative evaluation:

> . . . the importance of understanding people and programs in context; a commitment to study naturally occurring phenomena without introducing external controls or manipulation; and the assumption that understanding emerges most meaningfully from an inductive analysis of open-ended, detailed, descriptive, quotive data gather through direct contact with the program and its participants (Patton 1980:55).

It is also assumed that interviews can provide not only the perceptive data sought, but can be beneficial to the subjects. As Sanford (1982) argued, research interviews can and do benefit interviewees, by providing them:

> a chance to say things for which there had not previously been an appropriate audience. They can put into words some ideas and thought that had been only vaguely formulated. When these are met with attention and interest self-esteem rises. People who are interviewed have a chance to reflect on their lives, to take stock, to think out loud about alternatives (1982:897).

And, finally, the philosophical guidelines of the study are similar to those proposed for "democratic evaluation" by MacDonald and Walker (1975):

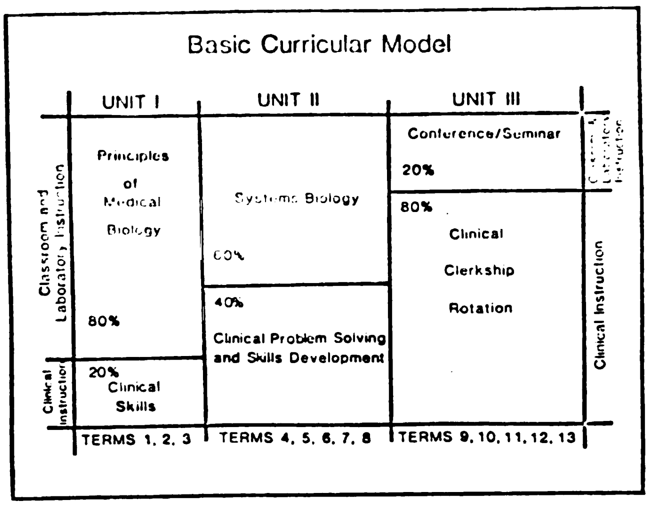
1. Its aim is to find ways of encouraging participants to develop insight into their world of learning.

2. Rather than setting proof as its primary goal, the case study aims to increase understanding of the variables, parameters and dynamics of the program and learning processes of students. Therefore, cross-checking, rather than consistency, is the main strategy for validation. An implicit assumption is that there is no one true definition of the phenomenon understudy.

3. Neither praise or blame is intended or inferred by the research. Contingency relationships will be presented so that the audience can draw its own conclusions as to cause.

Study subjects: Two principles guided the sample selection decision making: (1) purposeful sampling, in contrast to random sampling, can increase the utility of the information obtained from a small sample, and (2) depth and breadth of information are both important to the study (Patton 1980). The nature of the program and the experience of the investigator further refined the selection process.

Cross-sectional sampling was used, in which subjects were selected from each of the three phases of the educational program. The MSU-COM curriculum is designed in three phases, designated numerically as Units I, II and III. Each phase offers didactic and skill development learning experiences, but each successive phase offers increased time committed to clinical skill development and proportionally less time in didactic instruction. The curriculum model can be visualized:



Specifically, the phases have been described:[1]

UNIT I includes

- Basic science courses - to provide a foundation for the medical and clinical sciences; and
- Clinical skills labs - to develop basic skills of physical examination, medical interviewing, and osteopathic manipulative diagnosis;

UNIT II includes

- Systems biology courses - to provide a medical science foundation for each body system; and
- Osteopathic manipulative therapy skills labs - to develop and refine OMT diagnostic and therapeutic skills; and
- Family practice preceptorships - to provide an opportunity to refine clinical skills in a private practice setting; and

[1] MSU-COM 1982-83 Self-Study Graduate Survey

UNIT III consists of Externship and Jr. Partnership rotations - to refine and extend clinical diagnostic and management skills in the practice setting.

Based on the curriculum design, it was assumed that students at each phase of the program would have a level of competence different from counterparts in either of the other two phases; differences which could be described and which could serve as foci of analysis.

Twenty (20) students from each phase of the program were invited to participate in the study. Individual students were selected based on at least one of several factors: (1) the student's participation in informal discussion groups led by the investigator revealed that he/she was insightful about his/her educational experiences and was interested in providing constructive feedback to the program, and/or (2) it was thought that the student's pre-medical school life experience would broaden the range of variables to be considered in understanding competence at the various levels, particularly Unit I. No effort was made to assure that students included in the study were representative of their peer group with regard to age or academic achievement; neither was there any attempt to match students across groups. The primary intent was to get as broad a range of perspectives and experiences as possible, while assuring candid, insightful descriptions of individual perceptions of clinical competence and learning processes.

A total of thirty-seven (37) in-depth interviews were conducted: fifteen Unit I students, eleven Unit II students and eleven Unit III students. As Table 3.1 reveals, the sample group was representative of the population only with regard to age. The purposeful selection of equal numbers of males and females and those with and without training in an allied health occupation significantly diminished the representativeness of the sample group, while, it was thought, enhancing the opportunity to gain the insights of those subgroups.

TABLE 3.1

COMPARISON OF THE SAMPLE
THE POPULATION ON SELECTED
DEMOGRAPHIC CHARACTERISTICS

CHARACTERISTIC	UNIT I		UNIT II		UNIT III[1]	
	Sample	Population	Sample	Population	Sample	Population
N=	15	125	11	125	11	89
Age : range	22-38	20-38	23-37	20-37	23-39	19-43
: mean	27.6	25.7	28.5	26	27.0	24.6
Sex : male	40%	64%	45.4%	68%	45.4%	63.6
: female	60%	36%	54.6%	32%	54.6%	36.4
Graduate Degree	26.6%	10.3%	27.2%	22.3	9%	24.3
Health/Medical Occupation Certification	40%	9.6%	45.4%	17.6%	45.4%	6%

1 Unit III subjects include students from both the 1978 and 1979 entering classes. Population data represents the mean values for the combined classes.

The Interview Process

Cannell and Kahn describe the research interview as "a two-person conversation, initiated by the interviewer for the specific purpose of obtaining research-relevant information and focused by him on content specified by research objectives of systematic description, prediction or explanation (1968:527).

Patton elaborated that "the purpose of interviewing is to find out what is in and on someone else's mind. . . . We interview people to find out from them those things we cannot observe easily. . . . We cannot observe feelings, thoughts, and intentions. We cannot observe behaviors that took place at some previous point in time. . . . We cannot observe how people have organized the world and the meanings they attach to what goes on in the world. . . . The purpose of interviewing, "is to allow us to enter into the other person's perspective. The assumption is that the perspective is meaningful, knowable, and able to be made explicit," (1980:196).

The research interview also differs from the therapeutic interview in its intention to gather information that is measurable in some way. Borg and Gall (1979), outline four general steps for developing the interview process to insure measurability of the results:

a. Define the purpose of the study--its background, theoretical basis, general goals, possible applications of results, and reasons for using the interview methods.

b. Translate the general goals into detailed and specific objectives which can be fitted to the particular interview pattern you plan to follow, constructing questions yielding useful information.

c. Develop a tentative guide to be used during the interview, exploiting the advantages of the interview technique.

d. Develop a satisfactory method of coding and/or recording responses. Generally, responses can be pre-categorized in a pilot study to anticipate the most frequent response patterns. Only responses falling outside these general categories would need to be written out. Tape recording of the interview may offer

> advantages, unless the nature of the interview is highly personal and produces guarded response. A generally poor technique is a written summary of information recorded during or following the interview. Because of the pace of an interview, the act of writing either slows the interview unnecessarily or causes the interviewer to be selective in the kind and amount of information he records, at the risk of introducing bias (cite).

Of the three types of research interviews: unstructured, semi-structured and structured, a variation of the structured interview was selected for the study. This approach, using standardized, open-ended questions but pursuing individual issues in depth when appropriate, was intended to maximize the commonality of issues addressed by each of the three groups of subjects, while at the same time allowing the interveiwer to gain greater insight into the variables of the learning process. It was assumed that the greatest <u>depth</u> of insight could be gained by following the lead of the interviewee on particular issues, but that the greatest <u>breadth</u> of insight would be gained by asking common questions of all subjects within a particular subject group.

The Interview Schedule

Three distinct interview schedules, one for each Unit under study, were developed to elicit information regarding the subject's pre-MSU-COM experience, the nature of the individual's current clinical experiences, a description of specific clinical skills at the end of the current and previous Unit, explanations for perceived deficiencies and proficiencies in clinical tasks, and insights regarding instructional/learning processes.

The questions were designed to address the major physician tasks outlined in the program's various clinical course syllabi: conducting the medical history and physical examination (Units I, II, III), evaluating clinical data (Units I, II, III), proposing differential diagnoses (Units II and III) and developing management plans (Units II and III.) (See Chapter I, Figure 1.1, (B) Task.) The questions were arranged so as to lead the interviewee chronologically through his/her clinical experiences, and to culminate in post hoc assessments of those experiences. Each of the three different interview schedules followed the general outline:

A. Experiential background
B. Nature of the clinical experiences
C. Descriptions of clinical performance
D. Insights on clinical competence development

Experiences in field-testing the Unit I interview revealed that students with medically-related pre-MSU-COM experiences were more articulate about their perceptions of the inexperienced students' competence and the adequacy of the teaching/learning process for those students, than they were about exactly how and what they, themselves, did in the clinical setting. A separate interview schedule was, therefore, designed to elicit those insights from the experienced students. Experienced students in Units II and III were willing and able to provide both types of information and, therefore, one interview schedule sufficed for both experienced and inexperienced students. Drafts of the interview schedules were critiqued by the investigator's research director and by educational administrators of the program. Appendix A presents the four interview schedules used in the study.

Interview Process

Once the subjects were selected from their respective class lists, they were sent a letter describing the project and soliciting their participation. (Apendix A) Unit I and II volunteers returned a post card indicating preferred dates and times for an interview, while Unit III students were called to confirm participation and to set up appointments. Interviews of Unit I and II students were conducted in the investigator's college office, while Unit III interviews were conducted at the clinical site, usually in the hospital library or a classroom. In all but one case, the interviews were conducted in one session, and all were planned to accommodate the time constraints on the interviewee's time.

Initial Unit I interviews were recorded in hand-written notes only. When the investigator became aware of the subtle differences in descriptions and foci of attention expressed by students of various levels of experience, all subsequent interviews were tape recorded.

Timing was a crucial factor in interviewing the medical students. An effort was made to interview students as close to the time of completion of their respective Unit as possible. In the case of Unit I and II students, attempts to interview near the end of the final term of the Unit were frustrated by impending examinations. Interviewing Unit III subjects was particularly problematic, due to the fact that they were located in hospitals around the state and were no longer under the direct supervision of the College. Authority for access to the Unit III subjects was finally gained from the College and the respective Director of Medical Education post-graduation; hence, subjects were interviewed regarding their Unit III experience when they were actually involved in internship experiences. This posed several problems. First, the subjects were involved in a new level of responsibility - a phenomenon which likely put their Unit III experiences into a different perspective from that which might have been presented had they been interviewed while in the Unit III program. Second, the demands on interns' time and energy greatly complicated scheduling the interviews. One intern who agreed to participate rotated to an out-of-state hospital; one had just begun a rotation that was so short-staffed that he simply could not arrange an hour's time. Invariably interviews were conducted at the end of twelve-hour work shifts; but, although tired, all of the interns, with one exception, engaged themselves in the interview process. Often the interviews were in excess of an hour in length; one was pursued for well over two hours at the intern's insistence even though she had been on duty for twenty-four hours.

Cannell and Kahn (1968) cite three factors which influence the quality of the interviewers response: motivation, cognition, and accessibility. With the exception of one Unit III subject who was ill, all interviewees appeared to engage themselves in the process of the interview. Historically, students in this program have been encouraged to express their opinions on the program in course evaluations and research surveys; they have been candid and articulate in expressing those opinions. Those volunteering to be interviewed and actually taking time out of hectic schedules for the interview, showed motivation. Many subjects had had previous interaction with the investigator in informal discussions of their education, and were, therefore, well prepared to engage in the descriptive and introspective process required in the interviews. Many of the interviewees expressed appreciation for the opportunity to talk with someone about their experiences and to offer their opinions about ways to make the clinical experience more productive for students.

For some students the cognitive process of introspection and verbalizing throughts about what should be, was difficult. Usually, such questions as: "What would have been better for you, do you think?" "How did that make you feel?" "Why?," helped the interviewee express insights into his/her experiences. In some instances, the issue of clinical competence development (as posed in the questions: "What skills should a student have developed in Unit I in order to be prepared for Unit II?") was illogical from the student's view, since his/her view was that the program required no such pre-requisite. Difficulty in makng a distinction between the ideal and the real was usually resolved with other questions, but not always, as in case of one Unit III subject who, despite various approaches to the question, maintained no particular competence should be expected of individuals being awarded the D.O. degree. On the other hand, the cognitive abilities of the interviewer were also critical to the outcome of the interview. It can be assumed that had the investigator had a physician's knowledge of professional tasks and medicine, much more specific questions regarding the clinical competence of the interviewee could have been pursued.

Subjects at all levels had what seemed to be remarkable recall of their clinical experiences. For example, Unit III subjects had little difficulty in remembering the order and the general nature of preceptorships that they had taken one and two years previously. Clinical experiences during the previous year were recalled by all subjects in vivid detail, including clinician's names, critical incidents, patients and medical problems, and feelings and thoughts at the time of specific events. Situations that had been stressful or particularly rewarding seemed to be the most accessible.

In sum, many, but not all, of the problems attending interview research were minimized by the students' motivation to participate, and ability and willingness to candidly share their clinical experiences, and the investigator's familiarity with the program and the individual subjects. Any limitations in the data more likely reflect the investigator's lack of specific medical knowledge than subjects' lack of ability or willingness to provide the information.

Data Analysis

The general purpose of the data analysis in this study was to identify variables in the process of clinical competence development and to derive descriptors of competence at each level of the program. Content analysis (Krippendorff 1982), and contingency analysis (Osgood 1959), were used to analyze the information gathered from the in-depth interviews.

Design of the Analysis

As noted earlier, interview schedules were designed, based on an a priori conception of the continuum of clinical competence, to gain students' perceptions of clinical competence development. In this conception, clinical competence at each of the three levels of the educational program was presumed, based on program objectives, to parallel cognitive development (See Table 1.1, page 12). Descriptions of competence were further presumed to reflect the interaction of three major variables: the student, the didactic program and the practice conditions. Each of these variables subsumed other variables, such as:

Student	Didactic Program	Clinical Setting
. Prior experience	. Content	. Clinician's expectations
. Practice habits	. Skills training	. Patient's condition
. Attitude	. Faculty expectations	. Patient population

Implicit in this conception was a further presumption that clinical competence would be different for each of the three levels of education, but that students at a given level would have similar overall competence.

The first phase of the analysis was intended to clarify and extend this preliminary conception of clinical competence development, by describing through content analysis students' perceptions of what they are able to do in the clinical setting at the end of each of the three phases of the educational program and why.

According to Krippendorff, "content analysis could be characterized as a method of inquiry into symbolic meaning of messages," (1982:22). He cautions that given the symbolic nature of communication, one cannot claim to have analyzed the content of the communication, since the meaning depends on the perspective of the analysis. He adds the corollary caveat that intersubjective agreement of the meaning of messages and symbolic communications is unlikely, except in the most simple (and uninteresting) circumstance.

Krippendorff suggests the following conceptual framework for designing, conducting and evaluating content analyses:

1. it must be clear which data are analyzed, how they are defined, and from what population they are drawn;
2. the context relative to which data are analyzed must be made explicit;
3. the task is to make inferences from data to certain aspects of their context and to justify these inferences in terms of the knowledge about the stable factors in the system;
4. the kind of evidence needed to validate its results must be specified in advance or to be sufficiently clear so as to make validations conceivable.

(1982:26-28)

That is, the process of content analysis involves transforming the communicated information into data from which inferences can be made about how the data are related to the context.

The process of analyzing the content of the interviews gathered in this study was guided by the basic premise that the study was pre-theoretical and descriptive; i.e., it was intended to elaborate, rather than refine, the picture of the educational process by which osteopathic medical students developed clinical competence. It was, therefore, thought essential that the information remain as near as possible to the original form in which the student presented it, in order that readers could bring their own perspectives to the analysis of the data. For the same reason, it was thought important to describe the inquiry process used in coding and analyzing the information.

The analysis in this study focused on information students provided about their performance of specific professional tasks (history and physical examination, and medical problem solving), and the specific circumstances under which they performed those tasks (presumably, their antecedent knowledge and skills, and the conditions of practice). The frame of reference used to determine the data to be analyzed can be described, following Krippendorff (1980):

UNIT OF ANALYSIS	GENERAL DESCRIPTION	STUDY UNIT
Sample Unit	Material to be studied	Interviews of students at each of three levels of training
Recording Unit	Content category	Major issues
Context Unit	Portion of material to be examined	Entire text of interview transcript

Specifically, the information from each interview was categorized into the following units of analysis:

RECORDING UNIT	SAMPLE UNIT		
	I	II	III
H/P Competence	X	X	X
H/P Deficiencies	X	X	X
Explanation for H/P Competence	X	X	X
Diagnostic and Management Competence		X	X
Diagnostic and Management Deficiencies		X	X
Explanations for Diagnostic and Management Competence		X	X
Effect of Knowledge Prior to Experience		X	X
Effect of Practice Prior to Knowledge		X	X
Explanation of Integration of Theory and Practice		X	X
Antecedent Relevant Skills	X	X	X

Each step in the analytic process was undertaken to explore the nature of the phenomenon of osteopathic medical student experience. Some times laborious analyses of the interview content revealed little that appeared to be significant. A description of the various analyses is provided regardless of its apparent value.

Descriptive Analysis

The analysis began with transcribing verbatim the recorded interviews; then, each interview transcript was read several times in an attempt to understand the perspective of the subject. Third, all interviews within a given subject group (Unit) were read, in an attempt to gain insights into the experiences of students at that level of training and to identify issues that emerged. Finally, once a subjective "feel" for the interviews had been gained, a content analysis was initiated. This first level of analysis was descriptive, attempting to draw from each interview those statements which represented that subject's experiences, opinions, feelings and perceptions in regard to the central issues outlined by the interview schedule, as well as those that impressionalistically arose in the researcher's mind from the initial readings of each interview. Short descriptive phrases representing the subject's statement served as descriptor codes regarding the particular issue under study; i.e., pre-medical school clinically-related skills, history and physical examination performance deficiencies, etc. The entire transcript was searched for a response to the question issue. Phrase codes were recorded for each subject by experience category (see below), training level, and by issue, with care taken to not presume equivalency of similarly phrased statements. Once issue-related responses were recorded for all subjects in a particular training group, a numerical count was made of the subjects within the group offering that conceptual response; then the proportion of subjects using that code was calculated. A total of twenty-one analyses were conducted at this level. A series of content analyses was performed for each Unit, in turn. Some analyses were common to all levels of the program, whereas others were unique to a particular subject group.

Descriptive Analyses Common to All Units: There was a series of analyses performed on interviews from all three groups of subjects. In each case, the content analysis was performed using the entire interview transcript as the unit of analysis as described above.

1. **Classification of Subjects.** The first analysis was based on the initial presumption that students' pre-medical experiences might be important variables in the clinical competence developmental process. A codification for experience was devised, and all interview transcripts were coded according to the interviewee's

premedical training and experience in health-related or medically-related service roles.

Subjects were classified into five categories with regard to health/medical care experience and training:

I: No or extremely limited health-related or medical care experience or training.

II: Training and/or experience in a health-related occupation.

III: Training in a medically-related occupation but limited experience.

IV: Limited training but extensive experience in medically-related occupation.

V: Training and extensive experience in medically-related occupation.

These categories were established on the basis of certain definitions and assumptions.

Definitions:

a. Health-related occupations: refers to those human services roles, such as social worker, dietician, medical records administrator, counselor, administrator, which are supportive of but distinctly different from that of the physician role in terms of perspective, technical skills and/or critical knowledge base.

b. Medically-related occupations: refers to those roles, such as nurse, EMT, P.A., physical therapist, dental hygienist, radiology techologist, medical technologist, EKG technician, which are supportive of, and similar to that of the physician role in perspective, technical skills or critical knowledge base.

Assumptions:

- Training for and/or experience in a health-related or medical care role provided students with certain knowledge and/or skill advantages over "naive" students.

- Training and/or experience in a medical care role was more analogous to the physician role, thus giving students advantages over those in the health-related care category.

- Extensive experience in a medically-related care role provided more advantages to students than did training alone.

Using this classification system, subjects were distributed across categories of experience and training, and the Units of the program as follows:

EXPERIENCE CATEGORY	PROGRAM UNIT		
	I	II	III
I	4	4	2
II	2	4	4
III	1	0	0
IV	2	1	3
V	6	2	2
(Females)	8	5	5
(Males)	7	6	6

More specifically, in each Unit, subjects' clinical experiences ranged from none (other than visiting people in the hospital) to working for up to six years as a physician's assistant. Their education and training background ranged from students holding doctoral degrees (Ph.D.) but having no health care training or experience, to students holding baccalaureate degrees and being certified in one of a variety of allied health occupations (nurse, physician's assistant, emergency medical technician, respiratory therapist, EKG technician and medical technologist.)

This categorization scheme served as the basis for all subsequent analysis. That is, in all analyses transcripts were first sorted according to the experience category of the subject and the content analysis recorded by individual and experience category.

2. **Pre-MSU-COM Experiences.** In this analysis antecedent skills and experiences related to the professional tasks under study were specifically identified for each subject. This analysis was intended to clarify the _a priori_ experience codification, and to gain insight into subjects' perceptions of their preparation for clinical training and performance.

3. **History and Physical Examination Competence.** The medical history and physical examination are seen by the MSU-COM curriculum planners as critical tasks for osteopathic physicians. Training in the various skills related to these tasks is initiated in the first term of the program and is presumed to continue throughout the length of the program. These tasks, then, are obvious foci of the study of the developmental process of clinical competence. Of particular concern was what subjects perceived as the ideal competence at their particular level of training and what they perceived themselves to actually be able or unable to do and why.

4. **Instructional Environment.** All subjects were asked questions to elicit their perceptions of effective and ineffective clinical instruction. The content analysis was intended to identify variables related to clinical instruction and conditions of practice that affect competence development.

Descriptive Analyses Specific to Units: Given the program goals and the limited training and knowledge of Unit I students, it was assumed that more advanced professional performances, such as diagnosis and treatment, were not suitable issues to pursue with Unit I subjects. Hence, certain analyses grew out of the unique experiences of the Unit II and III students.

1. **Diagnosis and Treatment Competence.** Both Unit II and III students are taught and are expected to be able to engage in medical problem solving, including: identifying the chief complaint; evaluating clinical data; proposing a problem list; proposing relevant diagnostic procedures; developing a differential diagnosis; and planning and implementing therapeutic/management strategies. Content analyses were conducted to provide a description of the range of competence represented by the subjects and to propose a consensual description of optimal competence for both training levels.

2. **Explanations for Integration of Theory and Practice.** One of the assumed strengths of the MSU-COM curriculum is the fact of early and continuous clinical practice experiences for students. However, a recognized problem with the community-based educational model, is the difficulty in structuring relevant experiences concurrent with didactic instruction. In an effort to gain insight into the consequences of discontinuous theory and practice, descriptive analyses were performed based on Unit II subjects' responses to inquiries about the effect on performance of theory preceding practice, and the effect on learning and performance of practice preceding theory. This inquiry was pursued through questioning subjects about how they felt and what they could actually do when confronted with a patient with a chief complaint related to the renal system, for example, when they had <u>not</u> yet had and when they had <u>had</u> the renal system biology course. The situations posed were those which the subject had actually encountered, rather than hypothetical situations. The questioning also pursued the specific skills and knowledge that the didactic program provided them in performing clinical tasks.

Contingency Analyses

The central impression the investigator gained from the descriptive analysis was that, while all subjects were involved in learning and practicing similar tasks, there were differences in subjects' perspectives and points of focus as well as description of competency, depending on the subject's experience level. The experience variable seemed to be multi-dimensional. A method with which to explore these insights was sought; one which would be compatible with the exploratory nature of the study.

Exploratory studies such as the one reported here do not lend themselves to the rigorous quantitative methods of experimental and quasi-experimental research. As Cooley has argued:

> Exploratory approaches [to statistical analysis] are particularly useful in current studies of the effects of educational programs because of the primitive state of relevant theoretical models. Needed at this stage are statistical procedures that allow us to see the relative usefulness of different predictors or sets of predictors, as well as what confounding is occuring among independent variables, and what differences there are among different possible models for the data. At the exploratory stage, the data analysis should suggest ways in which the theoretical model might be modified, how the measures might be combined or separated, or which variables might safely be deleted from the model (1978:14).

And as he further pointed out, statisticians and educational researchers have by and large, ignored the challenge to develop appropriate statistical methods for "explanatory" studies.

Somewhat in contrast, Patton described the analysis of data from qualitative studies as "arty and intuitive" (1980:313). He claimed there are no statistical tests to confirm that a perceived pattern in an observation is significant. In fact, Patton proposes no quantitative methods to be used in analyzing qualitative evaluation data.

In this study the sampling procedure, alone, violates the principles of statistical analyses designed to assist in establishing the plausibility of a theoretical model or to establish the relationship of dependent variables. However, certain patterns of students' descriptions of their perceptions seemed to emerge and some methods of examining those insights was sought. Contingency analysis was selected to explore the initial impression that cumulative experience influenced how the students thought their clinical competence development.

Contingency analysis was thought to be the most appropriate manner of examining the psychosocial data and to be most compatible with the investigator's notion that an individual's psychophysiological state, overt behavior and cognitive structure are interdependent parts of a complex whole (Foa and Turner 1970; Catania 1973; Neisser 1976; Vygotsky 1978). That is, it was thought that what was said by the interviewee reflected what, why and how he/she thought about a particular phenomenon. The descriptive study of the interviews seemed to give merit to that presumption. For example, there appeared to be a contradiction in what Unit I students said about their history and physical examinations (that they were pretty good) and what experienced classmates said about the skills of their inexperienced classmates, and, what Unit II students, in retrospect, said about their Unit I competence. A method of analysis was needed that would make more clear the basis of those differences.

Contingency analysis is a correlational method that measures the probability of two symbols (statements, for example) being made within the context of a message. Based on association theory the contingency method assumes that greater-than-chance co-occurrence (contingencies) of the items in a message are indicative of the associations in the individual's thinking (Osgood 1959). The contingency assumes that: "(1) contingencies in experience come to be represented in (2) an individual's association structure by patterns of association and dissociation of varying strengths, which help determine (3) the contingencies in messages produced by this individual." (Osgood 1959:57) In principle, then, the statements of individuals reflect a psychological structure of association resulting from specific life experiences; they are an index of those associations, but only a tenuous index of the actual historical events. This method provides a means of comparing how subjects at the three levels of the program "think about" how they perform--what their concerns are about particular tasks, and, thereby, provides another means of conceptualizing the continuum of competence development.

Contingency theory would suggest that students with similar clinical experiences would perceive and, thus, describe those experiences similarly, all other things being equal. Several questions arise in the case where descriptions do not appear similar: Are the experiences not similar? Are "other things" "not equal" What "things" are not equal? How are experiences dissimilar? Presumably answers to those questions would be suggested in differences in patterns of contingencies for different groups of subjects. The descriptive study sugested that "level of experience" is a rather complex notion, at least in the context of the study case. At least two major division of "level of experience" seemed to affect how students view the program and their experiences, and what they do: (1) their current level of training in the formal program; and (2) the cumulative, related experience they brought to the medical school program. Contingency analyses were conducted using the two levels of experience to subgroup the subjects.

The Contingency Methodology: Each analysis began with the results of the descriptive analysis: the lists of descriptors for each of the major issues. First a raw data matrix was constructed, where each subject's use or non-use of each descriptor was recorded and the proportion of subjects using each descriptor calculated. Table 3.2 provides an example from the study.

Table 3.2

DATA MATRIX UNIT I H/P DEFICIENCES

Experience Category	Subject	Coded Descriptor					
		A	B	C	D	E	F
I	1	+	+	+	-	-	+
	2	-	-	-	+	+	-
	3	-	-	-	-	-	+
	4	-	-	+	-	-	+
	.	.	.	.	.	.	.
	.	.	.	.	.	.	.
	N						
		.09	.18	.45	.18	.09	.36

A contingency matrix was then calculated from the raw data. First, the expected (chance) probability of the co-occurrence of each pair of descriptors was calculated; e.g., the joint occurrence of A·B = (.09) (.18), etc. Then the actual co-occurrence of each pair of descriptors was found by counting the number of subjects using both of the descriptors, and determining their proportion of the total subgroup. When a pair of descriptors co-occur more frequently than expected they are said to be contingent, and are assumed to represent an association within the thinking of those subjects. Such contingencies are indicated in bold type on the matrix. Table 3.3 provides an example from the study.

Table 3.3

CONTINGENCY MATRIX: UNIT I H/P DEFICIENCIES

		A	B	C	D	E	F	. . .
	A	-	.016	.04	.016	.008	.03	
Obtained	B	**.09**	-	.08	.03	.016	.06	Expected
Contingencies	C	**.09**	.09	-	.08	.04	.16	Contingencies
	D	0	0	0	-	.016	.06	
	E	0	0	0	**.09**	-	.03	
	F	**.09**	**.09**	**.27**	**.09**	0	-	

A contingency analysis was conducted on all but one of the sets of descriptive data (antecedent relevant skills). In fact, a series of such analyses was conducted on each set of descriptive data: (1) including all subjects at a given training level; (2) including only category I-III experience subject at the level; (3) including only category IV and V subjects at that level of training; (4) including only category I-IV subjects, and (5) including only category V subjects. Each contingency matrix was compared with the intent of finding changes in patterns of associations. Two patterns emerged: (1) Unit II contingency matrices for category I-V, I-IV, and I-III subjects were similar, but dissimilar to the matrix for category V subjects; and (2) Unit III contingency matrices for category I-V and I-III subjects were similar, but dissimilar to those for category IV-V and V subjects. On the basis of these observations, presentation of the contingency analysis (Chapter V) focuses on contrasts between the two different subgroups with Unit II and Unit III subjects, I-IV/V and I-III/IV-V respectively. Due to the differences in interview schedules for experienced and inexperienced subjects in Unit I, such comparisons were not possible for the Unit I descriptive data. It must be again pointed out that subdividing already small sample groups would be indefensible in any thing but the most exploratory study.

Osgood (1959) proposed a standard error of a percentage test of the significance of contingencies, $\sigma p = \frac{pq}{N}$ where p is the expected value, q is equal to 1-p, and N is the total number of subjects. The standard error of percentage provides an estimate of how much an obtained percentage may be expected to vary about its expected value. Although initially proposed, the test of significance was abandoned because of the extremely small values for N in the study. For the purposes of this exploratory study, obtained contingencies exceeding the value for expected contingencies are considered to be "more significant" than those which do not.

Selected contingency tables are presented in the text of the report and all others may be found in the Exhibit section of the report. Where inspection of the matrix revealed clusters of descriptors with common contingencies, those patterns are described and discussed in the report.

It is emphasized that the sample unit and size do not fully support even this elementary statistical treatment of the data. The analyses are reported in full realization of their limitations and with the understanding that the exploratory nature of the study gives license to such methodological liberties.

Summary

This exploratory case study sought osteopathic medical students' perceptions of their clinical competence development through in-depth interviews. Content analysis of interview transcripts identified students' descriptions of clinical competence for each of the three phases of the educational program, and their ideas of what influenced their development of competence. Contingency analysis was used to further explore these descriptions and pursue insights gained from the descriptive analysis.

Twenty students were purposely selected from the approximate 125 students at each of the three levels of the program to participate in the study interviews. Thirty-seven (37) students who would shortly or just had completed one of the three units volunteered to participate in an interview.

Analysis of the interview data involved performing content analyses to describe each interviewee's experience, competence and learning process, and contingency analyses to gain further insight into the descriptive data. The following descriptive (D) and correlational (C) analyses were performed:

ANALYSIS	UNIT		
	I	II	III
H/P Competence	D,C	D,C	D,C
H/P Deficiences	D,C	D,C	D,C
Explanation for H/P Competence	D,C	D,C	D,C
Diagnostic and Management Competence		D,C	D,C
Diagnostic and Management Deficiencies		D,C	D,C
Explanations for Diagnostic and Management Competence		D,C	D,C
Affect of Knowledge Prior to Experience		D,C	
Affect of Practice Prior to Knowledge		D,C	
Explanation of Integration of Theory and Practice		D,C	
Antecedent Relevent Skills	D	D	D

The results of the content analysis are presented in Chapters IV and V. Chapter IV presents students' perceptions of the clinical competence, and Chapter V presents students' perceptions of the variables attending their development of competence.

CHAPTER IV

STUDENTS' PERCEPTIONS OF THE CONTINUUM OF CLINICAL COMPETENCE DEVELOPMENT

The current study was undertaken in an attempt to describe a continuum of clinical competence development for osteopathic medical studies. Specifically, to describe students' perceptions of what they are able to do in the clinical setting and how they achieved that competence. Chapter V will report students' explanations for their competence. In neither chapter does the investigator attempt to judge students' perceptions in terms of any program standards or any personally-held notions about osteopathic medical education. Such interpretations and conclusions will be presented in the final chapter.

In-depth interviews were conducted with 37 volunteer osteopathic medical students at the Michigan State University College of Osteopathic Medicine: fifteen Unit I students, eleven Unit II students and eleven Unit III students. Interviews were guided by interview schedules unique to each level of training with regard to the clinical experiences undertaken, but which emphasized common aspects of the students' clinical competence development:

- educational and experiential background;
- abilities in the performance of clinical tasks;
- notions of ideal clinical competence;
- how and why certain skills did and didn't develop; and
- how theory and practice was integrated.

This chapter reports students' perceptions on the first three of these issues.

In an attempt to gain as specific information as possible, students were asked to describe their pre-medical school health/medical training and/or experience, the details of their medical school clinical experiences, including: what they were expected to do by others; what they themselves sought to do; what they were permitted to do; and what they thought, in retrospect, they should have been able to do by the end of the unit. Since the clinical experiences at each level of the program are distinct, questions addressed the specific nature of the respective student's experience. At the same time, an effort was made to focus on tasks which were common to students at all levels; hence, certain professional tasks served as focal points: the history and physical examination, and diagnosis and patient management problem solving (including differential diagnosis, and treatment planning and execution.)

Subjects' responses to each of the various questions were, first subjected to a content analysis, where pertinent responses were identified within the text of the interview transcript, capsulized and recorded on a chart; each chart revealing for each unit each student's descriptive responses to a particular issue. The complete charts are presented as Exhibits A-G. The capsulized responses were then formed into more generic responses. These so-called coded responses were listed and frequency counts made for each group of subjects. The coded responses are presented in the text of this chapter where appropriate. Certain assumptions regarding the mediating effect of prior experience guided further analysis of the descriptive data.

An a priori categorization based on health- and/or medically-related training and/or experience placed subjects into five categories:

I: no or extremely limited health or medical care experience or training

II: training an/or experience in a health-related occupation

III: training in a medically-related occupation but limited experience

IV: limited training but extensive experience in a medically-related occupation

V: training and extensive experience in a medically-related occupation

This chapter, then, presents and interprets each student's description of his/her clinical competence in either of the two focal professional tasks, on the basis of three levels of analysis: program level (Unit I, II or III); pre-medical experiential level (Category I, II, III, IV, or V); and specific descriptive response. Three topical issues provide the organizational framework for the presentation of the analysis: educational and experiential background; perceptions of history and physical examination competence; perceptions of diagnosis and patient management competence; and descriptions of the continuum of clinical competence development.

Educational and Experiential Background

The initial phase of the interview sought students' perceptions of pertinent pre-medical school training and/or experience; i.e. education and experience they thought advantageous in their clinical training/practice experiences in medical school. It was reasoned that such antecedent knowledge and skill would provide an important template for medical school clinical performance; it was not known what or how these antecedents would affect clinical competence development.

Subjects at each of the three levels of training were asked to describe tasks they performed in any pre-medical experiences, including training programs, and to describe any skills they felt were useful in their training for the practice of osteopathic medicine. All subjects described skills they thought useful in medical training and/or were similar to those used by physicians. Table 4.1 lists those antecedent skills.

Table 4.1

ANTECEDENT PROFESSIONALLY-RELATED SKILLS
OFFERED BY ALL SUBJECTS

A	Interpersonal skills
B	Instruct/educate other
C	Make decisions/take responsibility
D	Appreciation of cross-cultural values
E	Interview
F	Knowledge of health care delivery system
G	Understand physician role
H	Had OMT training (limited)
I	Perform medical history
J	Perform partial physical examination
I	Perform medical history
J	Perform partial physical examination
K	Perform clinical procedures
L	Responsible for patient care
M	Perform treatment procedures
N	Do medical problem solving
O	Knowledge of medical records
P	Write prescriptions
R	Knowledge of clinical pathology
S	Know sterile technique

Students' descriptions of their antecedent skills were less affected by their levels of medical school training than by their pre-medical experience or training. The more closely related their pre-medical experience/training was to the physician role, the more specifically the skills resembled those students would learn in the medical curriculum. Conversely, the less related the experience to the role of the physician, the more general the reported skills. When the antecedent skills were examined in relation to the experience classification system and by level of program, patterns of skills emerged.

In Unit I subjects', antecedent skills differed depending upon whether their pre-medical education and experiences were <u>health</u>-related or were <u>medically-related</u>, and whether they actually practiced or were trained but didn't practice in the occupation. Table 4.2 demonstrates the results of this analysis.

Table 4.2

ANTECEDENT SKILLS OF UNIT I SUBJECTS

UNIT I CATEGORY	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
I(n=4)	+	-	-	+	-	+	+	+	-	-	-	-	-	-	-	-	-	-	-
II(n=2)	+	-	-	+	+	+	-	-	-	-	-	-	-	-	+	-	-	-	-
III(n=1)	+	-	-	-	+	+	-	-	-	+	-	-	-	-	-	-	-	-	-
IV(n=2)	+	-	-	+	+	+	+	-	-	+	-	-	-	-	+	-	-	-	-
V(n=4)	-	-	-	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+

These data reveal that Unit I students considered interpersonal relations skills, including interviewing, and some broad knowledge of the medical system to be useful to the medical student. A sharp distinction in reported skills is seen between Category V students (those with extensive training and experience in a medically-related occupation) and all others.

In Unit II, similar patterns of antecedent skills emerged across the five experience categories, as seen in Table 4.3:

Table 4.3

ANTECEDENT SKILLS OF UNIT II SUBJECTS

UNIT II CATEGORY	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	R	S
I(n=4)	+	-	-	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-
II(n=4)	+	-	-	+	+	+	+	+	-	+	+	-	-	-	+	-	-	-
III(n=0)																		
IV(n=1)	+	-	-	-	+	+	+	-	+	+	+	-	-	-	+	-	-	+
V(n=2)	+	-	-	+	+	+	+	-	+	+	+	+	+	+	-	+	-	+

And, again in Unit III, similar patterns of antecedent skills are seen across the five categories, except that the patterns appear more consistent with the initial rationale. Table 4.4 presents this analysis.

Table 4.4

ANTECEDENT SKILLS OF UNIT III SUBJECTS

UNIT I CATEGORY	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
I(n=2)	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
II(n=4)	+	+	-	+	+	+	-	-	+	+	+	+	-	-	-	-	-	-	-
III(n=0)																			
IV(n=3)	+	+	-	+	+	+	+	-	+	+	+	+	+	+	+	+	-	-	-
V(n=2)	+	+	-	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	-

One difference from students in the other two levels of training emerged here. The ability to instruct/educate (B) was seen by these clinical students to be an important skill. It should be noted that Unit III subjects were already interns when interviewed. As interns, these individuals were already involved in training clerks (Unit III students.) It is not known whether this new (non-Unit III) role or the need to guide/instruct patients as Unit III clerks influenced this perception.

When all levels of the program are combined in this analysis a pattern emerges that approximates the initial rationale, as seen in Table 4.5.

Table 4.5

ANTECEDENT SKILLS OF ALL STUDY SUBJECTS

EXPERIENCE CATEGORY	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
I(n=10)	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-
II(n=10)	+	+	-	+	+	+	+	+	+	+	+	+	-	-	+	-	-	-	-
III(n= 1)	+	-	-	-	+	+	-	-	-	+	-	-	-	-	-	-	-	-	-
IV(n= 7)	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	-	-	+
V(n= 8)	+	+	-	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+

Six descriptors of antecedent skills were common to all subjects, regardless of the level of training: interpersonal skills (A), instruct/educate others (B), appreciation of cross-cultural values (D), interview (E), knowledge of health care delivery systems (F), and understand physician role (G). It can also be seen that any health-or medical-related training or experience (Categories II-V) provided some skills (and/or perceptions) that students without such experiences did not have. Students with medically-related training and experience (Categories IV and V) cited very specific physician role-related antecedent skills.

Insights

This initial analysis merely specifies and confirms what is generally known: medical school classes are extremely heterogeneous. Not only do students vary greatly in their academic backgrounds, but they are similarly varied in their clinically relevent skills upon entry into medical school.

It is interesting to note that the subjects trained in the allied health occupations were specific-skill oriented. They quickly enumerated particular clinical tasks, for example medical history taking, that they had performed prior to entry into MSU-COM. They needed to be prompted with probing questions in order to described more general skills they had acquired through life experiences that could also be construed to be pertinent. On the other hand, the clinically naive students, particularly those with advanced educational backgrounds, more quickly identified analogous general skills, for example interviewing or knowledge of the health care system. There were, however, naive students who offered extremely limited insights and skills as descriptors of their relevent background, for example, "comfortable talking with elderly people."

The subjects' responses may, as one reviewer suggested, reveal an empirically oriented perspective, or, may reflect a "way of thinking" that they feel is appropriate for medical students. Currently, no account or accommodation for such antecedent skills is made in the curriculum. Whereas, students may take a waiver examination for any basic science course in which he/she feels competent to test, students have no mechanism by which to waive out of or modify clinical skills training experiences. If these policies reflect a more general attitude of dismissal of pre-medical experiences, these subjects' responses may merely reflect a pragmatic disengagement from their past, except as it most specifically relates to what they were then learning to do. It may well be, for example, that faculty do not specifically attempt to build on the students' existing knowledge and experience base through the use of analogy or comparison to the students' own experiential reference points.

Further insights regarding pre-medical clinical experience are described in each subsequent section of this chapter and in Chapters V and VI.

History and Physical Examination

Each unit of the program involves instruction and/or experience in the performance of the medical history and physical examination (H/P). Unit I provides training in the basic H/P and osteopathic manipulative diagnosis procedural skills, and provides a basic science foundation for understanding the rationale for interpreting anatomical, physiological, and psycho-social findings. Unit I students conclude this phase of their training by performing history and physical examinations in several ambulatory and hospital clinical settings. Unit II provides training in advanced osteopathic manipulative diagnosis and treatment, provides a medical science foundation for understanding the rationale for using clinical data in the medical problem solving process, and guides the students through a series of term-long clinical experiences in private, ambulatory care office practices. Unit III involves hospital-based and private practice-based clinical rotations, in which the students use and extend their skills by regularly performing history and physical examinations, as well as other professional tasks.

Based on their differences in accumulated knowledge and clinical experience, students at each of the three levels of the program were expected to have unique competence in the performance of the history and physical examination (H/P).

Unit I

Descriptors of competence at this level of the educational program were sought in interviews with two groups of subjects: those just completing the Unit (Unit I subjects) and those who had completed the unit during the previous year (Unit II subjects.) Interviews of Unit I subjects differed depending upon the interviewee's prior experience. Those having medically-related training and/or experience were asked to describe what and why their less-experienced classmates were able to perform in the clinical setting and to contrast that with their own performance. Therefore, descriptions of competence offered here refer primarily to those subjects who did <u>not</u> have prior medically-related training or experience. In fact, the experienced subjects did not engage in detailed discussions of their own performance and they seemed to disengage themselves from the training and clinical experience, taking a "big brother/sister" attitude towards the experiences of their more naive classmates.

<u>Competence</u>: Unit I subjects described their skills variously, as Table 4.6 reveals.

Table 4.6

DESCRIPTORS OF UNIT I H/P COMPETENCE

A	Had nine basic questions
B	Felt good about palpatory skills
C	Comfortable with interview
D	Zeroed in on the chief complaint
E	Could discern abnormals
F	Did thorough job
G	Had protocol for H/P
H	Comfortable handling instruments
I	Comfortable with procedures
J	Did excellent social history
K	Had basics of eye exam
M	Could ask more questions in pre-med area
N	Confident of H/P skills
O	Pursued clues around chief complaint
P	Comfortable with setting/environment

MSU-COM students at this level generally had learned a general protocol for the history and physical examination, had mastered the mechanics of the physical examination procedures, and could quite comfortably engage a patient in an interview process. They had not the medical knowledge base for pursuing either the history or physical examination investigation beyond the protocol, for interpreting the findings they collected or modifying procedures to accommodate specific situations patients present, for example, having injured limbs which compromise the standard structural examination.

Individual Unit I subjects, because of pre-medical experience, had particular skills, knowledge or insights that exceed this generalization. For example, a nutritionist was able to pursue pertinent history and physical examination data related to the patient's diabetes beyond that which naive students described themselves as being able to do. Subjects with Physician Assistant (P.A.) training described their medical history taking and physical examination training and performance as "more thorough than physicians." Exhibit A presents the specific statements that Unit I subjects used describing their H/P skills.

Looking back to their first (Unit I) hospital history and physical examination, Unit II subjects described their competence somewhat differently than did Unit I subjects, as shown in Table 4.8.

Table 4.8

DESCRIPTORS OF UNIT I H/P COMPETENCE
OFFERED BY UNIT II SUBJECTS

	Descriptor	Experience Category I (N=4)	 II (N=4)	 III (N=0)	 IV (N=1)	 V (N=2)
		percent response				
A	Took 2-3 hours to complete H/P	25	25	-	100	0
B	Write-up extensive	25	25	-	0	0
C	Everything equally important	25	25	-	0	0
D	Do history, then physical exam	25	0	-	0	0
E	Sympathetic/concerned for patient	50	25	-	0	0
F	Follow strutured protocol	50	100	-	100	0
G	Awkward with procedures	25	25	-	0	0
H	Quit procedures if taking too long	25	25	-	0	0
I	Self/role-conscious	25	25	-	100	50
J	Do complete history and physical	25	0	-	0	0
K	Confident	0	0	-	0	100
L	Competent history skills	0	0	-	0	50
M	Smooth manner	0	0	-	0	50
N	Get adequate information	0	0	-	0	100
O	Learned H/P prior to MSU-COM	0	0	-	0	100
P	Tailor H/P to chief complaint	0	0	-	0	100

In light of their contemporaneous experiences in preceptor offices, Unit II subjects were more critical than complimentary of their Unit I competence. Even when they described their write up of the H/P as being "extensive," they were critical of their inability to sort out the important from the unimportant.

<u>Deficiencies:</u> As one might expect at this level of training, subjects, generally, were unable to interpret historical or physical examination clues or to pursue them beyond the standard protocol. Certain procedures were particularly

troublesome with regard to recognition of anatomical and physiological phenomena: fundascopic examination, auscultation of the heart and lungs and palpation; and for more than half, the standard review of systems questions. Specifically, Unit I subjects used descriptors for their deficiencies listed in Table 4.9.

Table 4.9

DESCRIPTORS OF UNIT I H/P DEFICIENCIES

A	Don't know how to do a pediatrics exam
B	Didn't follow protocol
C	Problem with eye exam
D	Didn't do physical examination
E	Couldn't palpate enlarged spleen
F	Uncertain about heart sounds
G	Uncertain about lung sounds
H	Problems with systems review
I	Uncertain about identifying abnormals
J	Can't label abnormal findings
K	Uncomfortable with OMT
L	Problem with physican role
M	Uncertain about verbalizing instructions
N	Not certain how much to demand of patient
O	P.E. skills 'rusty'
Q	Preoccupied with procedural routines

Unit II subjects, notably medically-inexperienced subjects, in reporting their deficiencies described a general <u>angst</u> about their Unit I history and physical examination experience and performance. As was noted, their descriptors of 'competence' were phrased as critical evaluations of their performance, so it was to be expected that their descriptions of deficiency would be equally critical. Table 4.10 lists their descriptions of Unit I H/P deficiencies:

Table 4.10

DESCRIPTORS OF UNIT I H/P DEFICIENCIES
OFFERED BY UNIT II SUBJECTS

	Descriptor	Experience Category I (N=4)	II (N=4)	III (N=0)	IV (N=1)	V (N=2)
		percent response				
A	Didn't know what was doing	25	25	-	0	0
B	Didn't know terminology	25	0	-	0	0
C	Got no information	25	0	-	0	0
D	Anxious	25	25	-	0	0
E	Not see or hear cues	25	25	-	0	0
F	Couldn't tie information together	25	50	-	100	0
G	Couldn't identify normal or abnormal	25	25	-	100	0
H	Eye exam mechanics	25	25	-	0	0
I	Couldn't tailor H/P to chief complaint	0	0	-	100	0
J	None	0	0	-	0	100

Generalizations About Unit I H/P Performance: Clinical performance in training programs must be seen in the gestalt of the educational-practice environment, both from a historic and an immediate perspective. Each of the subjects perceived the experience differently, and brought to it different skills and expectations. All of the Unit I subjects concluded that "whatever I did was fine," a post-hoc view which, it is presumed, mediated their retrospection and descriptions of competence. Since these students perceived that accuracy and precision were not the faculty/supervisor's expectation, they were generally positive about their performance if they felt that they had gotten through the H/P without embarassing themselves. A preoccupation with self and uncomfortableness in the role of student physician was described by all but the most experienced subjects.

The manner in which Unit I students rationalized their clinical performance is portrayed in these few representative excerpts of interviews:

> I feel good about my palpatory skills. . .
> The chart said 'slight spleen enlargement,' but I didn't feel anything. But the chart said 'slight,' so I didn't worry about it.

> I couldn't see anything on the fundascopic. I expected to see some diabetic retinopathy. It looked like grey bilateral areas that might have been cataracts. I didn't look on the chart about that. But I couldn't focus; decided it was me or a cataract. That's one place where I bluffed.
>
> I am pretty comfortable with the eye exam... I could not see much in the eyes, but the room was so bright, so the pupils were constricted. The patient's chief complaint had nothing to do with eyes, so I didn't worry about that.
>
> If I had to do the examination for anything more than my own edification, I probably would have insisted. But as it was, I didn't...I was inconveniencing him so I just said, "It isn't important." If I had been on a clerkship it would have been important, because I would have been accountable for it. It was acceptible to everybody that whatever I did was o.k.--it was no big deal!

In contrast, Unit II subjects retrospectively viewing their Unit I performance through "re-ground lenses," were less sanguine. Their experience during Unit II had led them to conclude that is is "a big deal" if you don't feel, see, or hear what you should, or if you fail to perform an examination because of technical imcompetence or inconvenience. Unit I subjects saw themselves as intruders upon patients; intruders in the sense that they were not a part of the patient's health care team no were they competent to provide any particular service to the patient. Unit II subjects on the other hand saw themselves as providing care to patients, having responsibility to be the "eyes and ears" of the physician who was caring for the patient. This new sense of responsiblity to the recipient of care requires a new level of accountibility and competence. In fact, the investigator's experience talking with some of the Unit II subjects when they were first year students, leads her to conclude that their Unit I skills and attitudes were not dissimilar to those described by the current Unit I subjects.

The following generalizations were drawn from the statements offered by Unit I subjects:

- Students had various personal goals for the experience: to practice their skills; to meet assumed expectations of faculty (to get "correct answer"); to meet requirements of the course.

- Students experienced more discomfort with the orientation and patient selection process than with the actual H/P experience.

- Students followed protocols, usually through use of "crib sheets," when performing both the history and the physical examination.

- Despite any inability to "see" and "hear" or to interpret what was seen or heard, students described their H/P skills as "good," "comfortable," "confident of skills," and even "thorough."

- With the exception of those with medically-related pre-medical school experience, students were unable to pursue chief complaint clues, due to their lack of medical science knowledge.

- Students perceived their role as non-physician learners and as such assumed no authority to impose time demands or discomfort on patients. Therefore, they eliminated procedures, especially structural examinations, when they had questions regarding their relevance or their safety for the patient.

- Students emphasized those aspects of the H/P for which their pre-medical school experience best prepared them.

- Students <u>without</u> medically-related pre-medical school experience described their clinical competence at the end of Unit I:

MEDICAL HISTORY	Can establish patient rapport Can get patient to share information Follow a routine protocol Have basic questons to be asked Can't pursue chief complaint with more specific systems questions

PHYSICAL EXAMINATION	Follow protocol Can handle equipment Comfortable with procedures Usually recognize findings which aren't "normal" Difficulty in visualizing anatomic structures in eye exam Most difficulty recognizing abnormal findings in eye exam, heart and lung auscultation Descriptions of findings usually framed in lay terms Don't know what findings mean clinically Know how to <u>look</u> competent
H/P WRITE UP	Didn't do

Unit II

Descriptions of competence at this level of the educational program were sought in interviews with two groups of subjects, those just completing Unit II (Unit II subjects) and those who had completed the Unit more than a year earlier (Unit III subjects.)

<u>Competence</u>: The history and physical examination described by Unit II subjects reflected increased confidence in their medical student role and skill, and a more indepth medical science knowledge base. They generally describe themselves as being able to effectively establish rapport with office practice patients; to conduct good history and physical examinations, and to distinguish between normal and abnormal physical findings; and to be able to recognize clues from the H/P that they would have ignored in Unit I, and to pursue those clues with a more in-depth investigation. The H/P was now geared to the chief complaint, as compared to a comprehensive H/P of Unit I students, and was fairly well routinized.

The specific descriptors used by Unit II subjects to describe their H/P performance are listed in Table 4.11.

Table 4.11

DESCRIPTORS OF UNIT II H/P COMPETENCE
OFFERED BY UNIT II SUBJECTS

A	Comfortable with procedures
B	Good pelvic examination
C	Good chest examination
D	Good ear examination
E	Good vitals (B/P)
F	OMT is better
G	Palpatory skills better
H	More observant
I	Good eye examination
J	More objective in performing examinations
K	More confident
L	Can better distinguish abnormal from normal
M	Get accurate information
N	Good well-baby physical examination
O	Comfortable with rectal examinations
P	Get good histories
Q	H/P skills were developed prior to MSU-COM
R	Competent in interpretations of findings

When these descriptors were keyed to the subjects' pre-medical experience, certain patterns in responses emerged, as shown in Table 4.12. The least experienced subjects (Category I) used more specific descriptors of their competence than the most experienced subjects (Category V). Experienced subjects appeared to emphasize newly-acquired or expanded competence (OMT, palpatory skills, cardiovascular examination, and interpretation of findings), while embracing the technical skills of the history and physical examination under the single comment that their "H/P skills were developed prior to entering MSU-COM."

Table 4.12

DESCRIPTORS OF UNIT II H/P COMPETENCE OFFERED BY UNIT II SUBJECTS IN EACH EXPERIENCE CATEGORY

	Descriptor	Percent Response By Experience Category				
		I (n=4)	II (n=4)	III (n=0)	IV (n=1)	V (n=2)
A	Comfortable with procedures	75	25	-	100	0
B	Good pelvic examination	50	25	-	100	0
C	Good chest examination	25	25	-	100	50
D	Good ear examination	25	0	-	100	50
E	Good vitals (B/P, 35c)	25	0	-	-	-
F	OMT better	75	50	-	0	50
G	Palpatory skills better	25	0	-	100	50
H	More observant	25	0	-	0	0
I	Good eye examination	25	0	-	0	0
J	More objective in performing examinations	25	0	-	0	0
K	More confident	0	75	-	0	0
L	Can better distinguish normal from abnormal	50	0	-	-	50
M	Get accurate information	25	50	-	0	0
N	Good well-baby examination	25	25	-	0	0
O	Comfortable with rectal exam	25	25	-	100	0
P	Get good histories	0	25	0	100	0
Q	H/P skills developed prior to MSU-COM	0	0	-	0	100
R	Competent in interpretation of findings	0	0	-	0	100

Exhibit B present each of the statements Unit II subjects used to describe their H/P performance.

When asked to describe their Unit II H/P competence, Unit III subjects used an equal number, but different descriptors, as shown in Table 4.13. Unit III subjects' descriptors seem to focus on the meaning of data, while Unit II subjects focus on the means of gathering accurate data. However, inexperienced Unit III subjects' descriptors can also be interpreted as more focused on technical aspects of the H/P (knowing what questions to ask, knowing criteria for normal, organization of the H/P) than were those of their peers with medically-related experience. Nonetheless, the language of Unit III subjects was distinct from that of the Unit II subjects, suggestive of their broader conception of the role of the history and physical examination in the medical problem solving process.

Table 4.13

DESCRIPTORS OF UNIT II H/P COMPETENCE
OFFERED BY UNIT III SUBJECTS

		Percent Response by Experience Category				
		I (N=2)	II (N=4)	III (N=0)	IV (N=3)	V (N=2)
A	Pre-natal checks	50	0	-	0	0
B	Begin to distinguish abnormal from normal	50	25	-	0	0
C	Ask routine questions	0	25	-	0	0
D	Identify system of chief complaint	0	25	-	66.6	0
E	Explain something about possible problems	0	25	-	33.3	50
F	Gather accurate data	0	25	-	100	0
G	Have some labels for abnormalities	0	50	-	0	0
H	H/P as good as average D.O.	0	50	-	0	0
I	Identify chief complaint	0	25	-	0	0
J	Make decent problem list	0	25	-	33.3	50
K	H/P tailored to chief complaint	0	25	-	0	50
L	Good basic systems review	0	50	-	0	50
M	Limited facility in proposing problem list	0	25	-	0	0
N	Thorough history	0	25	-	0	0
O	Good organization of H/P	0	0	-	66.6	50
P	Comfortable with pelvic exam	0	0	-	33.3	0
Q	H/P same as prior to MSU-COM	0	0	-	0	50
R	Broader, longer problem list	0	0	-	0	50
S	Comfortable with all routine office procedures	0	0	-	0	50

<u>Deficiencies</u>: Certain Unit I deficiencies in the history and physical examinations persisted in Unit II: performing the fundascopic examination; interpreting auscultation of the heart and lungs; and palpation. In addition, at least a third described problems with pelvic and rectal examinations, and some noted problems in describing findings in proper medical terminology. The most experienced subjects denied having any problems with the history and physical examination at this level of training.

Table 4.14 presents the range of descriptive statements Unit II subjects used to describe their H/P deficiencies:

Table 4.14

DESCRIPTORS OF UNIT II H/P DEFICIENCIES
OFFERED BY UNIT II SUBJECTS

A	Problems with eye exam
B	Rectal exam not good
C	Endoscopic exam not good
D	Problems with chest sounds
E	Psychiatric/neurologic evaluation
F	Uncertain about palpatory diagnosis
G	Uncomfortable with pelvic exam
H	Need practice on entire H/P
I	Not sure what to do for each patient
J	Dictation of H/P
K	Accuracy of description of findings
L	History incomplete
M	None

Again, inexperienced subjects described their H/P deficiencies differently from experienced subjects, as shown in Table 4.15. Although certain deficiencies, such as the eye exam, neurologic exam, palpation and medical terminology, persist across experiential groups, the most experienced subjects offered far fewer descriptors of their deficiencies. One experienced subject, a former physician's assistant, claimed to have no deficiencies.

Table 4.15

DESCRIPTORS OF UNIT II H/P DEFICIENCIES OFFERED
BY UNIT II SUBJECTS IN EACH EXPERIENCE CATEGORY

		Percent Response by Experience Category				
		I (n=4)	II (n=4)	III (n=0)	IV (n=1)	V (n=2)
A	Problems with eye exam	75	50	-	100	50
B	Rectal exam not good	50	25	-	0	0
C	Endoscopic exam not good	25	0	-	0	0
D	Problems with chest sounds	25	50	-	0	0
E	Psychiatric/neurologic evaluation	25	0	-	0	0
F	Uncertain about palpatory diagnosis	25	75	-	0	50
G	Uncomfortable with pelvic exam	0	75	-	0	0
H	Need practice on entire H/P	0	50	-	0	0
I	Not sure what to do for each patient	0	25	-	0	0
J	Dictation of H/P	0	50	-	0	0
K	Accuracy of description of findings	0	25	-	0	50
L	History incomplete	0	0	-	100	0
M	None	0	0	-	0	50

Unit III subjects offered more descriptors of their Unit II history and physical examination deficiencies than did Unit II subjects. As shown in Table 4.16, subjects with medically-related training and/or experience used different descriptors from subjects without such training and experience. Inexperienced subjects described deficiencies both in technical skills and in data interpretation ability, while more experienced subjects tended to point up organizational and data interpretation deficiencies.

Table 4.16

DESCRIPTORS OF UNIT II H/P DEFICIENCIES

OFFERED BY UNIT III SUBJECTS

		Percent Response by Experience Category				
		I (n=2)	II (n=4)	III (n=0)	IV (n=3)	V (n=2)
A	Not able to evaluate patient	50	0	-	0	0
B	Weak physical exam skills	50	0	-	0	50
C	Not able to hone in on chief complaint	50	25	-	0	0
D	Miss subtle findings	50	0	-	0	0
E	Weak n interpreting data	0	25	-	0	0
F	Heart sounds identification	0	25	-	0	0
G	Miss things in PE	0	25	-	0	0
H	Difficulty developing problem list	0	25	-	0	0
I	Inadequate pelvic exam	0	25	-	0	0
J	Didn't feel competent	0	25	-	0	0
K	Certain systems knowledge weak	0	25	-	33.3	0
L	Tend not to know what looking for	0	0	-	33.3	0
M	Disappointed in OMT skills	0	0	-	33.3	0
N	Can't weed out unimportant	0	0	-	33.3	0
O	Not always recognize abnormal	0	0	-	33.3	50
P	Not able to label findings	0	0	-	33.3	0
Q	Couldn't integrate H/P	0	0	-	33.3	50
R	Not get beyond general	0	0	-	33.3	0
S	Not efficient	0	0	-	0	100

When one examines the descriptors used by Unit II subjects with those offered by Unit III subjects, further comparisons can be made. Although both subject groups point to certain technical deficiencies, Unit III subjects' various other descriptors go beyond the procedural aspects of the history and physical examination. As was noted in discussing the descriptions of competence, Unit III subjects had come to think about the H/P differently from Unit I and Unit II subjects; i.e. as an integral part of the diagnostic process, and had greater insight into the importance of knowledge of pathology and disease in performing the history and physical examination. Just as the Unit II subjects with prior medically-related experience tended to focus on their problem solving competencies and deficiencies, the Unit III subjects, looking back at their Unit II performance, viewed it with their current criteria in mind.

Generalization about Unit II H/P performance: Unit II subjects, in contrast to Unit I students, performed the H/P as part of their preceptors' patient care services. Their performance was necessarily geared to the constraints of the practice environment. As their descriptive statements show, they no longer attempted to perform a complete H/P as learned in their MSU-COM skills laboratory, but rather, attempted to collect accurate date pertinent to the patient's chief complaint within the time constraints of the particular preceptor's office. Certain procedures, for example structural evaluation, may have been infrequently used--in which case subjects assumed these skills to have deteriorated. This orientation towards professional practice and away from student practice forced a shift in perspective at several levels. First, there was a shift away from self towards attention to the validity of the data. Although there was self-consciousness in the student-physician role, there was an increasing effort to provide a service to the patient and to meet the expectations of the preceptor. This change in perspective, secondly, changed the tone of the subjects' self-evaluations. Most subjects appeared to have raised the standard by which they judged their performances.

The Unit II subjects' perspectives on clinical performance is conveyed in the following selected excerpts:

> Everything is geared to the chief complaint. You learn to take the short cuts and which short cuts to take from feedback from the doc. I sit down and talk directly with the patient and get the chief complaint, but I tend to do the systems review as I am doing the physical exam. The signs and symptoms direct the questions. In Unit I you just follow the protocol and worry about whether you left anything out.

> In Unit I if I didn't visualize the ear drum, I'd chart 'couldn't see the ear drum.' In the preceptor's office [Unit II], I might have to ask the nurse to help me wash out the ear--then take a good look. I would be thinking otitis media in that case. I didn't realize the seriousness in Unit I. Now lots of things are going through my mind--I am not just thinking about the ear drum.
>
> When I started to tailor-make the history [in Unit II], and when I talked with the physician about the patient, I would find out that I had omitted something critical, and then go back in. I would make more than one trip into the room with the patient. I think that is a healthy sign in the early stages.
>
> There are somethings that I almost always do: I look in the eyes because I need the experience; I always listen to the heart for the same reason and because I think everyone should have it; every kid I look in the ears, because ear problems are so diffuse and common in kids. Past that, it [PE] is focused.

More specifically the following generalizations can be drawn from Unit II subjects' statements:

- Students are concerned with looking and sounding good to preceptors and patients.
- Without relevant knowledge, in the form of prior clinical experience or having had the pertinent systems course(s), students feel uncomfortable, are insecure and function slowly and methodically.
- Student competence in performing the H/P is related to the amount of accumulated knowledge and experience.
- Systems courses provide students with such functional knowledge as an understanding of the pathophysiology of the particular disorder at hand, questions to elicit pertinent data in the history, and criteria for recognizing and interpreting signs.
- Proficiency in conducting the history and physical examination is increased from the end of Unit I to the end of Unit II--the amount depending upon the nature of pre-medical competence.

- Skills quickly diminish without constant practice. Many skills learned in the Unit I skills labs are not practiced in the clinical setting.

- The primary "competence" standard for Unit II students is to "feel comfortable" doing the task. The definition of "comfortable" varies with the student.

- Students specifically describe their H/P performance in the following way:

MEDICAL HISTORY	Can establish rapport--patient-oriented, but guided by preceptor's style Focus on chief complaint Try to conform to constraints of practice; i.e. time, process, protocol Identify chief complaint and pertinent system(s) Ask pertinent questions to explore chief complaint in more depth Know meaning of questions and answers
PHYSICAL EXAMINATION	Focus on chief complaint Perform pertinent procedures re chief complaint Can handle equipment comfortably Can transcend procedures to attend to patient Can usually decribe findings in medical terminology Can pick up on and pursue clues with further history and/or physical examination Can interpret findings--know criteria for normal Nearly all procedures under control Pursue collection of data as part of responsibility to patient
WRITE-UP	Follow procedure used by preceptor to chart findings

Unit III:

Descriptors of competence at this level of the educational program were sought in interviews with individuals who had, several months earlier, completed the educational program and were at the time of the interview interns.

<u>Competence</u>: The history and physical examination performed by Unit III students is fundamentally different from that performed by Unit II students, both in structure and competence. Unit III students routinely perform complete admission H/P's in hospital rotations, the results of which they dictate for inclusion in the patients' medical record. They describe being able to do an accurate, thorough, and efficient medical history, and being able to gain increased information from the physical examination. The most striking feature of the subjects' description of their H/P performance was their confidence, as evidenced by their <u>lack</u> of detail in describing their H/P skills, either positively or negatively.

As Table 4.17 reveals, all Unit III subjects expressed general satisfaction with their history and physical examination. Whereas relatively inexperienced subjects described increased skill in gaining subtle information through the H/P and more finese in interpreting abnormal findings, students with prior medically-related experience described gaining confidence in their organizing the data into more efficient systems for diagnosis, which can be considered a higher level of professional competence.

Table 4.17

DESCRIPTORS OF UNIT III H/P COMPETENCE

	Descriptors	Percent Response by Experience Category				
		I	II	III	IV	V
A	Conduct good history	50	100	-	100	100
B	Can ask more specific questoisn	0	75	-	33	50
C	Can distinguish normal form abnormal findings	0	75	-	0	0
D	Prepare an accurate write-up of H/P	0	0	-	33	50
E	Conduct thorough physical examination	50	50	-	100	100
F	(Can identify systems) involved in chief complaint	0	0	-	33	0
G	Am confident	0	0	-	0	50
H	Can assess the cardiovascular status	0	0	-	0	50
I	Have identified pertinent signs and symptoms for generic problems in all systems	0	0	-	0	50

Exhibit C shows the descriptions of history and physical examination competence offered by each of the Unit III subjects.

Deficiencies: It is in their descriptions of deficiencies that one can make the clearest distinction between the experienced and inexperienced subjects. The inexperienced students variously described specific weaknesses in their clinical data collection skills: not efficient, miss refined clues, cardiology evaluation weak, etc. On the other hand, experienced subjects either offered no deficiency descriptions or spoke of inefficiencies only in writing treatment orders.

Specific descriptors of deficiency used by Unit III subjects are presented in Table 4.18.

Table 4.18

DESCRIPTORS OF UNIT III H/P DEFICIENCIES

	Descriptors	Percent Response by Experience Category				
		I (n=2)	II (n=4)	III (n=0)	IV (n=3)	V (n=2)
A	Not efficient	0	25	-	0	50
B	PE skills not as good as should be	0	25	-	0	0
C	Cardiology evaluation	0	25	-	33	0
D	Neurology evaluation	0	25	-	0	0
E	Respiratory evaluation	0	0	-	33	0
F	Refining H/P for detailed system evaluation	0	0	-	33	0
G	Describing things not seen before	0	0	-	33	0
H	No deficiencies described	50	25	-	33	50
I	Lack in-depth medical knowledge	0	0	-	33	0
J	Miss subtle signs and symptoms	0	0	-	33	50
K	Uncomfortable with semi-independent responsibility	0	0	-	0	50

<u>Generalizations about Unit III H/P performance</u>: As previously noted, the Unit III students, particularly when in hospital-based rotations, are expected on a routine basis to perform and dictate accurate, pertinent histories and physical examinations on newly admitted patients. The students, thus, gain a good deal of practice doing the complete H/P while at the same time increasing their base of knowledge of clinical medicine. Both skills and confidence in performing the H/P increase to a new level of competence during Unit III.

The following excerpts demonstrate the changing perceptions of clinical competence offered by Unit III subjects:

> I think that I thought I was pretty thorough in the history [in Unit II] because I thought I did a pretty good job of systems review and systematically went through from head to toe. We had some basic questions to ask for systems review. But [now] when you work with specialists you find out that each sub-category has to be pinned down--there are additional questions to ask if they say "yes" to one of those basic questions.
>
> History and physical examination are the most important clinical skills. I include differential diagnosis under the H and P.
>
> You have to approach each patient as though you know nothing about them. Alot of times the physician will just say, "Direct your H/P towards the chief complaint." That's O.K. if you have 20 years of experience and you can pick up on things, but as an extern, intern or resident you have to get a system down so you can be pretty confident that you ask all the right questions and you have properly examined all the parts of the body that can be problems for the patient.
>
> You not only have to be able to do an adequate general history and physical examination on each area but you also have to be able to get in specific questions in each area in order to get in your diagnosis.

These comments reveal a different perspective on the role of the H/P and the degree of sophistication of knowledge of clinical medicine (pathology) necessary to performing an "adequate, thorough" H/P. Unit III subjects, in contrast to both Unit I and Unit II subjects, were involved in solving complex medical problems. They were beginning to understand the relationship of the H/P to his/her personal knowledge, and how the physician's diagnostic acumen hinges on that knowledge. In that light, the deficiencies described by Unit III subjects cannot be equated with similar deficiencies described by Unit II or, surely, Unit I subjects.

Certain generalization were supported by Unit III subjects' statement:

- Students' confidence and competence in all areas of clinical skills are greatly increased over those of Unit II.
- Subjects perceive themselves to be more thorough in the performance of the medical history and physical examination than the average D.O. practitioner.
- Higher standards of performance are self-imposed, based on insight into specialist's level of knowledge and skills.
- Efficiency in performing the H/P greatly increases through the course of Unit III.
- Competence at the Unit III level is generally described:

MEDICAL HISTORY	Thorough and accurate Self-confident Know important questions to ask Can elicit pertinent information on all systems Data collections focuses on differential Data collection efficient
PHYSICAL EXAMINATION	Thorough and accurate Much improved in distinguishing normal from abnormal Get basic information for identification of problems Do good assessment of the systems Procedures and protocols are routinized Data collection focuses on differential

The medical history and physical examination were integrated to the extent that the student thought appropriate or productive.

Diagnosis and Patient Management

Both Unit II and Unit III provided instruction and experience related to medical problem solving. Unit II provided, through the systems biology courses, the basis for understanding the normal structure and function of each system and the pathophysiology of system-related disease. Through the preceptorship experiences students were provided opportunities for applying didactic information to the practice of medical problem solving in the ambulatory care setting. In these settings patients most often presented with routine primary care problems and students were involved in collecting clinical data pertinent to the presenting problem (chief complaint) and proposing a problem list, a diagnostic evaluation process and a treatment plan.

Unit III provided students with both ambulatory and hospital care clinical experiences. Generally students extended their clinical medicine knowledge base by being directly involved in the diagnosis and management of patients on a case-by-case basis. By the nature of the medical problems of hospitalized patients in particular, students were involved in a problem solving process requiring more in-depth knowledge than they had acquired in Unit II. Based on differences in their knowledge base and the type of problems they confront, students at the second and third levels of the program were expected to have unique competence in medical problem solving. It was assumed that Unit I students were not involved in diagnosis and management of medical problems.

Unit II

Competence: As shown in Table 4.19 subjects used a variety of descriptors of their problem solving abilities. On the basis of frequency of reference to each descriptor, students at this level have generally developed an ability to identify abnormal findings from the H/P, to accurately identify the chief complaint, to correctly identify the associated body system, to propose at least a short list (3 to 4) of possible problems which are congruent with the clinical data, and to recall protocols for diagnosing and treating routine problems with which they have had experience. Subjects with medically-related experience who have worked in ambulatory settings have routinized protocols from which they diagnose and manage primary care problems.

Table 4.19

DESCRIPTORS OF DIAGNOSIS AND TREATMENT COMPETENCE OFFERED BY UNIT II SUBJECTS

	Descriptors	Percent Response by Experience Category				
		I (n=4)	II (n=4)	III (n=0)	IV (n=1)	V (n=2)
A	Include osteopathic evaluation in differential	0	0	-	0	50
B	Confident/comfortable	25	0	-	100	100
C	Can propose problem list	25	100	-	100	100
D	Will be in the "ball park" on differential	25	0	-	100	50
E	Can do cardiovascular review	25	25	-	100	100
F	Know/use references for problem solving	50	25	-	0	0
G	Look up drugs for treatment	50	50	-	100	0
H	Know routine drugs if have worked on case	25	50	-	100	50
I	Can problem solve simple (one system) problems	25	0	-	0	0
J	Learning list of routine G.P. cases	25	0	-	100	0
K	Can integrate systems knowledge in diagnosis	25	0	-	0	0
L	Use general terminology in problem solving	0	50	-	0	50
M	Comfortable with Gynecologic cases	0	50	-	100	100
N	Can develop problem list for symptoms	0	25	-	100	0
O	Can identify system of chief complaint	0	25	-	100	100
P	Comfortable with respiratory problems	0	25	-	100	100
Q	Comfortable with all systems	0	0	-	100	100
R	Can propose rationale for diagnostic tests	0	0	-	0	50

Exhibit D shows each Unit II subject's description of his/her diagnostic and treatment competence.

Deficiencies: Unit II subjects also used a variety of descriptors for their problem solving deficiencies, as shown in Table 4.20. The general deficiencies acknowledged by students at this level were limited knowledge of drugs of choice and inability to work-up patients with multi-system problems. Additional observed deficiencies depended upon the individual student's experience. The ability to work-up particular systems or problems was described as a deficiency when such a problem or system had not been worked-up because it was not confronted, or the subject was unable to work-up the case when it was confronted.

Table 4.20

DESCRIPTORS OF DIAGNOSIS AND TREATMENT DEFICIENCIES OFFERED BY UNIT II SUBJECTS

	Descriptors	Percent Response by Experience Category				
		I (n=4)	II (n=4)	III (n=0)	IV (n=1)	V (n=2)
A	Uncertain about renal problems	25	25	-	0	0
B	Uncertain about respiratory problems	25	0	-	0	0
C	Uncertain about neurology problems	0	0	-	100	50
D	Both old and young patients are a problem	50	25	-	0	0
E	Don't know drugs of choice	50	25	-	0	0
F	Multi-systems problems difficult	25	50	-	100	0
G	Have problems with people who don't speak English	25	0	-	0	0
H	Don't know treatments	50	0	-	0	0
I	Uncertain about dermatology problems	0	0	-	100	0
J	Have trouble refining initial problem list	0	25	-	100	0
K	Don't know diagnostic tests	0	25	-	0	0
L	Problem list not accurate much of the time	0	25	-	0	0
M	Have trouble working up things not see before	0	25	-	0	50
N	Don't have medical terminology for describing findings	0	25	-	0	50
O	Am slow	0	25	-	0	0
P	Forget important questions	0	0	-	100	0

Generalizations about Unit II medical problem solving: Unit II students, in the absence of extensive knowledge of clinical medicine, had limited confidence and skills in medical problem solving. Students used their accumulating systems biology knowledge to assist them in interpreting clinical data. They used clinical texts, drug references and the preceptor to guide them through the problem solving process. The following general statements were supported by interview data:

- Without the relevant knowledge and experience with a particular clinical problem, the student feels uncomfortable and functions slowly and methodically.
- Approaches to problem solving and management are very much influenced by models presented by preceptors, unless the behavior modeled is counter to the student's philosophy and/or "scientific principles."
- Students gear their activity to the constraints of the practice in which they work; i.e. do things as the preceptor does them, reduce the time for procedures.

Unit III

Competence: Unit III students were intensely engaged in the process of learning how to diagnose and manage specific medical problems. Accordingly, their confidence and competence differed from Unit II subjects. Particular statements characterize Unit III subjects' descriptions of competence:

- can do initial work-up,
- can organize data into a few possible problems,
- know basic admitting orders,
- know the initial diagnostic tests to be performed,
- can start the initial treatment regimen,
- know drugs for certain problems,
- have an idea of how to initially manage an emergency.

The interviews made clear, however, that these generic skills were limited to those types of clinical cases with which the student had had sufficient practice.

Table 4.21 lists the descriptors used by all subjects in describing their problem solving skills.

Table 4.21

DESCRIPTORS OF DIAGNOSIS AND TREATMENT COMPETENCE OFFERED BY UNIT III SUBJECTS

	Descriptors	Percent Response by Experience Category				
		I (n=2)	II (n=4)	III (n=0)	IV (n=3)	V (n=2)
A	Self-confident	0	0	-	33	100
B	Can organize information into a few possible problems	50	50	-	66	100
C	Can do initial work-up	50	25	-	66	100
D	Know initial diagnostic tests	50	25	-	66	100
E	Can start initial treatment regimen	50	25	-	33	100
F	Can read chest and abdomen X-rays	50	25	-	0	50
G	Know drugs for certain problems	0	50	-	66	50
H	Know basic admitting orders	0	50	-	66	50
I	Have idea about managing emergency cases	0	25	-	100	50
J	Try to think holistically	0	25	-	-	-
K	Know quick differential for emergency problems	0	25	-	0	50
L	Can handle COPD cases from beginning to end		0	50	-	0
M	Can write good progress reports	0	25	-	0	0
N	Can handle G.I. problems from beginning to end	0	50	-	0	0
O	Can handle cardiovascular problems	0	50	-	0	0
P	Can work-up hematology problems	0	25	-	0	0
Q	Can read EKG's	0	0	-	33	0

Exhibit E presents individual Unit III subjects' descriptions of their diagnostic and treatment competence.

Deficiencies: Unit III subjects cited a host of deficiencies in their ability to diagnose and treat medical problems. As seen in Table 4.22, three of these deficiencies were common to almost all students at this level of training: they had not memorized drug dosages; their differential diagnosis was limited and included broad, rather than specific, problems; and, they had limited knowledge of the specific diseases.

Table 4.22

DESCRIPTORS OF DIAGNOSIS AND TREATMENT DEFICIENCIES OFFERED BY UNIT III SUBJECTS

	Descriptors	Percent Response by Experience Category				
		I (n=2)	II (n=4)	III (n=0)	IV (n=3)	V (n=2)
A	Can't manage complete patient work-up	50	25	-	33	50
B	EKG interpretation	50	0	-	0	0
C	Can't manage "new" diabetic	50	0	-	0	0
D	No appreciation for pediatrics	50	0	-	0	0
E	Back pain evalaution/differential	50	0	-	0	0
F	Treatment management for diabetic acidosis	50	0	-	0	0
G	Work-up for anemia	50	0	-	0	0
H	Work-up for renal disease	50	0	-	0	0
I	Work-up for cirrhosis	50	0	-	0	0
J	Knowledge of medical problems limited	50	50	-	33	50
K	Drug dosages	0	50	-	66	0
L	Refinement of problem solving weak	0	50	-	66	50
M	Admitting orders not routine	0	25	-	0	0
N	Distressing to work from PE alone	0	25	-	0	0
O	Write inadequate progress notes	0	25	-	0	0
P	Neurology	0	25	-	0	50
Q	Orthopedics	0	25	-	0	0
R	Handling respiratory problems	0	25	-	0	0
S	I.V. therapy	0	0	-	66	0
T	Variations in treatment for common problems	0	0	-	33	50
U	Lack of confidence in decision making	0	0	-	66	50

<u>Generalizations about Unit III medical problem solving competence:</u> The medical problem solving competence described by Unit III subjects was distinctly different from that described by Unit II subjects. However, in this small group of subjects there appeared to be a wide range of definitions of individual competence. The subjects who had medically-related experience prior to medical school continued to have more confidence in their clinical performance than those with no or less relevant medical experience. As one experienced subject stated:

> I had everything down going into internship. It was just a matter of refining it. . . There were things that I did as a medical corpsman I haven't been allowed to do as a doc yet.

Competence was described in terms of specific types of medical problems, rather than generic skills. Hence, subjects who had not worked-up certain cases described themselves as being deficient in diagnosing and managing those types of cases. It becomes apparent that students do not have uniform experiences with regard to the types of cases with which they work; hence, the specific and wide ranging descriptions of deficiencies. Too, it must be taken into consideration that the subjects of this part of the study were then currently involved in their internship. They were looking backward to Unit III from the perspective of a new level of responsibility, a fact important to what associations are made and how performance is evaluated by students.

Certain other generalizations can be made based on students' comments:

- Students' confidence and competence in all areas of clinical performance are greatly increased over those of Unit II.

- Students' primary goal is to routinize the prescribed protocols for management of "common" medical cases that they will be responsible for as interns.

- In the absence of supervised responsibility for a patient's diagnosis and management--as in coat-tailing or attending lectures--the student perceives him/herself to be incompetent to work-up and follow-up the generic problem represented by the patient.

- Competence at the Unit III level is generally described:

DIFFERENTIAL DIAGNOSIS	Have identified "packages" of signs and symptoms for generic problem of system Can propose problem list of at least 3 or 4 specific possible problems for each system Have good differential approach to systems in which there was good clinical instruction Able to work-up more complex (multi-system) problems Know routine diagnostic procedures to employ to work-up differential Likely not to know esoteric diagnostic procedures Can interpret EKG's and routine chest and abdominal films

MANAGEMENT	Know routine admitting orders for frequently encountered problems Know first-level management of frequently encountered emergency situtations Have not routinized drug dosages except for frequently encountered emergency problems Have limited knowledge and familiarity with therapeutic regimens such as I.V. therapy, acute respiratory therapy, etc. May or may not have performed normal delivery Have insight into the complete history of a medical problem--out-patient and in-patient presentations Have developed certain technical skills used in diagnosis and management, such as: suturing, vena puncture, arterial puncture, pelvic exam, rectal exam, intubation, catheterization, central venus line.

Insights

The subjects of this exploratory study brought to their clinical experiences their cumulative life experiences, as well as skills and knowledge they had gained in the medical school program. Just as each individual's life experience was different, each had a different perspective, demonstrated unique skills, and gained different outcomes from each clinical experience. It is this investigator's impression that Unit I students drew heavily from their past experience when confronted with the initial challenges of patient interaction. They tended to operate from their "civilian" experiences; i.e., emphasizing those aspects of the history or physical examination for which they felt they had the most background.

Students' pre-medical school experiential base can carry them through certain aspects of Unit II and Unit III experiences as well; however, it is health and medically-related experiences which are significant at the more advanced stages of clinical training. With each succeeding Unit <u>medically</u>-related experiences became the most supportive. These "special refuges of confidence" were important to students, for they provided them with at least one bit of knowledge, skill or insight on which they could depend, and, perhaps, even distinguish themselves from peers. Comments by subjects point up this dependence on a special skill/knowledge:

> My goal when I came to medical school was when I got to the hospital to be able to do one thing better than people around me.
> (Unit II subject)

> People out in internship report not being able to visualize vessels on the fundascopic exam. I guess I attribute it [skills in performing fundascopic exam] to my mechanical background. If I don't see anything I will re-position myself or the instrument until I see what I am supposed to see. (Unit I subject)

> When I do a medical history I think I emphasize the social aspect of one's health situation more so than other students. Although I think it is very important to look at the medical aspects, I am not as comfortable with it. I have noticed that my social histories are much more complete. I have also found that in my interactions with patients, emotional sharing often occurs that they say is unique for them.
> (Unit I subject)

> I can go into a room with a patient complainng of chest pain and symptomology--the things I learned in the ER (prior to MSU-COM)--of real patients. In school they teach classical presentation, but they didn't tell you how your patient was going to look: grey color.
> (Unit III subject)

However, this exploratory study suggests that typologies of experience such as the one used, may serve a limited purpose. It is unlikely that such categories will predict performance, per se. However, further exploration of the ways in which students draw on their life experiences could serve as a basis for modifying clinical experiences for individuals and categories of students and for advising students in their professional development.

These data also support a well known but often ignored or forgotten fact: medical school does not produce <u>a</u> competent physician. Individuals graduating from medical schools, like any other graduate educational program, are each unique in their competence. The standards for the definition of that competence may be self-designed, program designed, or even undefined, depending upon the degree to which the program specifies its standards of performance and the degree to which the student pro-actively guides his/her professional development. This issue will be discussed further in Chapter V.

In general, it is possible to distinguish the clinical competence of subjects at each of the three levels of training. And further, the differences are not only in the professional tasks which students at each level can perform, but also in the very nature of how, why and with what a particular task is undertaken. Data collected through the H/P performed by Unit I subjects, for example, differ in substance and meaning from those collected by Unit II subjects; and Unit III subjects are able to collect even more specific, relevant, comprehensive information than Unit II subjects. There is a continuously accumulating body of knowledge which at each level of training increases the mechanical finesse with which students perform procedures, the meaning of data for students and the student's ability to organize data into meaningful information with which to solve medical problems.

The accumulating knowledge and skills, together with increased responsibility for patient care, mediates shifts in students' definitions of what they could and couldn't do at a particular level of training. At the time of study within a particular unit, subjects were inclined to draw fairly positive descriptive images of their performances, even though they could identify many specific deficiencies. In retrospect, however, they were inclined to focus on what they were unable to do, in light of their new levels of understanding of what one should be able to do. This phenomenon is demonstrated in Exhibit F where Unit II students contrast their Unit I and II H/P performance, and in Exhibit G, where Unit III subjects describe their Unit II H/P performance. In these comparisons, students across levels of training consistently described performance competence for a particular Unit, but tended to be more critical in assessing deficiencies at a former level of training. This is, of course, part of the socialization process of adopting a new role, shifting from a "lay" person's perspective to that of an "expert."

It is not clear to what extent the lack of clear clinical performance standards influences students' performances at a particular level, or their descriptions of their performances. As noted earlier, Unit I students concluded that the clinical experience was designed to merely allow them an opportunity to interact with patients in a clinical setting. This experience, they concluded, was designed neither to improve nor to evaluate their H/P skills. These students also commented that when upper class persons assured them that it would be a low-pressure experience, they did not particularly worry about or make a special effort to prepare for the experience.

It is likely that any description of competence for a given level of training offered by this study is unique to this program at this point in time; it may not be pertinent to the MSU-COM program if clinical experience goals change, nor are the specific descriptions likely to be relevant to any other program.

Descriptions of the Continuum of Clinical Competence Development

There are several possible approaches to empirically defining competence for each of the three levels of training at MSU-COM based on the data from this study. One approach is to draw together the composite descriptions of competence as defined by subjects' perceptions of their actual performances. Another approach is to describe the ideal image of performance which subjects proposed when reflecting on what they should have been able to do. Descriptions of the continuum of clinical competence developments based on both of these approaches are proposed.

Comparisons of Competence Based on Performance

Descriptions of clinical performance were provided by subjects at each of the three levels of the training program. Those descriptions were presented above for each level. Table 4.23 draws together those descriptions.

These descriptions, together with insights gained from the interviews, point up some distinguishing features of the continuum of clinical competence development described below.

FEATURE	UNIT CHARACTERISTIC		
	I	II	III
Role Perspective of Student	Student/lay-person	Student-physician[1]	Physician-student[2]
Knowledge Base	Basic science; Pre-medical experience	Basic medical science; Pre-medical experience	Basic clinical medicine; Basic medical science; Pre-medical experience
Focus of Clinical Learning	Patient interaction; Data collection skills	Refinement of data collection skills; Interpretation of clinical data; Treatment protocols	Refinement of data interpretation; Development of clinical management knowledge and skills
Professional Task Assignment	H/P	H/P; Diagnostic problem solving; Drug therapy management	H/P; Diagnostic and Management problem solving
Level of Focus of Learning	Procedure mastery (mechanical); Self-conscious	Procedure mastery (protocol/process) Knowledge-conscious	Preparation for internship; Patient-management-conscious
Standard Bearer	Self (Clinical faculty)	Adjunct faculty (Self; Clinical faculty)	Specialists (Self)

1/2 Current discussions in medical ethics suggest the term "student-physician" to be ethically/legally inadvisable. The term, and its mirror image, are used here to emphasize a psychological/role orientation. The terms are not advocated for general use.

Table 4.23

SELF-DESCRIPTORS OF ACTUAL CLINICAL COMPETENCE

TASK	Unit I	Unit II	Unit III
HISTORY	Can establish rapport--patient-oriented Comprehensive Follows protocol Slow, methodical Can identify "chief complaint" Describe C.C. in 'lay' terms Unable to interpret data May not be able to 'control' situation Feel as though imposing self on patient Have few, standard questions for system review	Can establish rapport--patient-oriented but guided by preceptor's style Focus on chief complaint Try to conform to constrints of practice; i.e., time, process, protocol Identify chief complaint and pertinent system(s) Ask pertinent questions to explore C.C. in more depth Know meaning of questions and answers Feel as though contributing to patient care	Thorough and accurate Self confident Know important questions to ask Can elicit pertinent information on all systems Data collection efficient
PHYSICAL EXAMINATION	Complete, unfocused Follow standard protocol Slow, methodical Self-conscious about techniques Can "look like" performing procedure correctly May be able to recognize but not identify abnormal findings Certain procedures problematic: fundescopic, percussion, auscultation Unwilling or uncomfortable imposing self on patient in pursuit of data	Focus on chief complaint Perform pertinent procedures re C.C. Can handle equipment comfortably Can get beyond procedure to patient's problem Can usually describe findings in medical medical terminology Can pick up on and pursue cues with further history and/or PE Can interpret findings--know criteria for normal Nearly all procedures under control--need more experience with fundescopic and auscultation in order to feel comfortable in interpreting normal from abnormal Pursue data as part of responsibility patient	Thorough and accurate Much improved in distinguishing normal from abnormal Get basic information for identification of problems Do good assessment of systems Procedures and protocols are routinized Data collection focuses on differential Medical history and physical examination are integrated to the extent thought appropriate or productive
CLINICAL PROBLEM SOLVING DIAGNOSIS	Unable to interpret findings, follow cues of history or physical exam, or propose problem list unless premedical experience/training provided necessary medical knowledge	Generally "get in the ball park" of the problem Pursue clues to collect pertinent data from appropriate system(s) Conscious and knowledgeable of the interrelatedness of systems Propose problem list of limited number of general possible problems--may need to use reference Usually can propose a plan to rule out possible problems--likely to use reference May be able to propose diagnosis in general terms	Have identified 'packages' of signs and symptoms for generic problems of systems Can propose problem list of at least 3 or 4 <u>specific</u> possible problems for each system Have symptoms-oriented differential for emergency problems Have good differential approach to systems in which had good clinical instruction Able to work-up more complex (multisystem) problems Know routine diagnostic procedures to employ to work-up differential Likely not to know esoteric diagnostic procedures Can interpret EKSs and routine chest and abdominal films
MANAGEMENT		May have general proposal for treatment i.e. drug regimen, if can use reference Except for OMT, only aware of <u>drug</u> treatment modality	Know routine admitting orders for frequently encountered problems, including nursing care Know first-level management of frequently encountered emergency situations Have <u>not</u> routinized drug dosages except for frequently encountered emergency situations Have some knowledge and familiarity with therapeutic regimens such as I.V. therapy, acute respiratory therapy, etc. May or may not have performed a normal delivery Have insight into the complete, history of a medical problem--out-patient and in-patient Have developed certain technical skills used in diagnosis and management, such as: suturing, vena punctures, arterial puncture, pelvic exam, rectal exam, intubatin, catheterization, central venus line

As the composites point out, clinical competence can be distinguished at the three levels of training at several levels of analysis. The descriptors presented here, based on the students' actual experiences, may or may not be what the program intends. They do, however, provide useful points of comparison for the ideal competence statements these same subjects proffered.

Comparisons of Competence Based on Ideal Statements

Subjects at each of the three levels of the program were asked to describe what a student should be able to do at a given level in order to be prepared for the next level of training. Statements of ideal performance at the Unit I level were provided by subjects who had had training and experience in a medically-related occupation and were then completing Unit I, and by Unit II subjects. The ideal statements for Unit II were elicited from subjects then completing that portion of the program; and Unit III ideal statements were provided by subjects who had completed the program.

A fairly circumscribed set of skills and knowledge were proposed for Unit I students:

A Operate equipment properly
B Talk comfortably with any patient
C Elicit data, including chief complaint
D Follow H/P protocol and hospital rules
E Ask basic questions about the chief complaint
F Be able to use palpatory diagnostic skills
G Not understand what data means
H Know process of rectal and pelvic examinations
I Use medical terminology to describe findings
J Recognize abnormals for each procedure
K Know roles of hospital personnel
L Know organization of hospital and ward
M Be able to find information in patient's chart

It is interesting to note that experienced Unit I subjects and Unit II subjects proposed similar descriptors, but only the Unit I subjects proposed organizational skills and knowledge (K, L, M).

Unit II student proposed an extensive list of skills and knowledge that should be gained in Unit II:

A Do PE exam properly
B Do thorough ENT examination
C Do thorough chest examination
D Do proper pelvic examination
E Know criteria of normal physical findings
F Be able to perform OMT treatment for all regions of body
G Identify systems pertinent to the chief complaint
H Elicit more elaborate history of chief complaint (than Unit I)
I Propose problem list for any system, using references
J Propose limited problem list
K Develop a diagnostic approach to problem list
L Modify PE to history and physical findings
M Effectively palpate and percuss
N Know normals for routine diagnostic tests (lab and X-ray)
O Write prescriptions
P Distinguish normal from abnormal EKG
Q Read chest and abdomen X-rays
R Give injections
S Draw blood
T Suture lacerations
U Know drug and non-drug approaches to common problems
V Instruct patient on follow-up routine

Here we note that Unit II subjects used the same procedural perspective to describe Unit II ideal competence that they used in the describing the Unit I ideal competence.

Unit III subjects proposed an extremely long list of skills and knowledge to characterize the ideal hospital-based Unit III competence at the time of graduation:

A	Work effectively with staff
B	Get information from current and historic patient records
C	Get services from hospital resources
D	Admit patient with proper admitting orders
E	Write routine patient care (nursing) orders
F	Perform effective/thorough medical history
G	Perform effective/thorough physical examination
H	Write on-going care notes
I	Assist effectively in surgery
J	Perform normal delivery
K	Know normal delivery procedures
L	Know abnormal delivery procedures
M	Perform accurate H/P on newborn
N	Accurately evaluate the newborn
O	Know post-partum procedures
P	Know psychological evaluation procedures and definitions
Q	Evaluate routine X-rays
R	Know routine laboratory tests and how to interpret them
S	Use I.V. antibiotic therapy properly
T	Know basic routine for Codes
U	Diagnose and manage basic medical cases
V	Administer local anesthetic
W	Diagnose and manage shock
X	Know surgical procedures in which have assisted
Y	Be able to read and interpret journal articles
Z	Know medical terminology
AA	Know specific references for each specialty
BB	Know basic drugs for cases (U): classification and uses
CC	Read EKGs
DD	Triage emergency cases
EE	Be able to start I.V., catheterize, and intubate
FF	Personally perform routine lab tests

In addition, Unit III subjects proposed a list of skills and knowledge that should be gained from the Junior Partnership (ambulatory care) experience:

A Be familiar with routine business procedures
B Understand patient care system of practice
C Be able to counsel on birth control and apply I.U.D.s
D Remove warts and moles
E Remove toe nails
F Know internal medicine
G Diagnose and manage routine G.P. problems
H Interpret EKGs
I Interpret routine X-rays
J Develop criteria/rationale for refering patients
K Manage interpersonal relations
L Develop definition of wellness and illness
M See hospital care in the perspective of primary care
N Learn follow-up care strategies
O Perform effective pelvic examinations
P Give injections
Q Perform effective rectal examinations
R Learn how G.P. uses hospital services and personnel
S Be able to perform triage of emergency cases

Table 4.24 presents composite ideal statements of clinical competence for each of the three levels of training.

Comparison of Actual and Ideal Statements of Competence

Two important differences between subjects' actual and ideal competence statements emerge. First, there is much more consensus on what "should be" than "what is," particularly when talking about the technical, medical procedures. It appears that from the vantage point of entering the next level of responsibility, it becomes clear to students that there are some generic skills and knowledge that mark the entry to the next level of practice and development.

Second, their perspectives appear both broader and more specific when the subjects reflected on what they should have gained at any particular level. Some, but not the majority of subjects, cited, for example, skills and/or knowledge at the organizational level of both the health care facility and patient management: knowing the politics of the organization; being familiar with the office procedures;

Table 4.24

DESCRIPTORS OF IDEAL CLINICAL COMPETENCE

TASK	Unit I	Unit II	Unit III (hospital)	Unit III (office)
ORIENTATION	Know role of hospital personnel Know organization of hospital and ward Have basic understanding of organization of patient records	Be professional, including neat and clean Know personal, ethical and legal limits	Know organizational politics of hospital Understand own role in organization Know medical record system	Know routine business procedures Understand patient care system for private practice Manage interpersonal relations
MEDICAL HISTORY	Establish rapport with patient Communicate effectively Do history following protocol Use standard review of systems questions Identify chief complaint	Interact effectively with all patients Have general categories of questions for review of systems Identify systems pertinent of chief complaint Elicit more elaborate history of chief complaint (than Unit I)	Effectively communicate with people of all ages and circumstances Perform thorough history	
PHYSICAL EXAMINATION	Perform PE following routine protocol Master equipment and technical procedures Recognize gross abnormalities for each procedure	Perform PE adequately on persons of all ages Proficiently perform: reflexes; ear, eye and throat examinations; auscultation and percussion of heart; percussion of liver; palpation of abdomen Tailor PE to medical history findings Know criteria for physical findings Perform effective pelvic and rectal examinations	Perform comprehensive PE Accurately interpret findings	
DIAGNOSTIC PROBLEM SOLVING	Unable to interpret findings, unless had previous clinical experience	Have an approach to problem solving all common G.P. clinical problems Propose problem list for all systems, using reference Know routine tests to order for cardiovascular, respiratory and renal problems	Convert knowledge into symptoms approach to problem solving Work-up all basic medical cases Know diagnostic protocol for common emergency cases: M.I.; angina; hypertension; diabetes; asthema; seizures Read EKG's Evaluate the newborn Know routine diagnostic tests and how to evaluate them Read chest and abdomen films Diagnose shock	Understand definitions of illness and wellness Interpret EKG's and X-rays
MANAGEMENT PROBLEM SOLVING	Unable to propose or implement treatment plans, unless had previous clinical experience	Write prescriptions Use references to identify drugs and dosages Perform OMT on all regions of the body Know some drug and non-drug approaches for common G.P. problems Be able to: draw blood give injections Instruct patient on follow-up routine	Perform normal delivery and NB care Know Code protocol Know basic drugs for common cases: classification and use Know references for specialties Be able to read journals Can start I.V.s, catheterize, and intubate Can manage basic medical cases for each system	Know primary care management protocols Cordinate out-patient and in-patient care Counsel on birth control; I.U.D.s Treat all common problems Learn follow-up protocols Give injections Develop rationale for referring patients Remove warts, nails, moles
RECORD MANAGEMENT			Write concise, accurate H/P report Write good progress notes Write proper admitting notes, including nursing care	

understanding the continuum of wellness-illness-disease; knowing non-drug management strategies for common health problems. These descriptions stand in sharp contrast to the disease management orientation they described themselves as actually doing. At the same time, the subjects had concluded that there were specific clinical problems and knowledge that they should be able to manage.

From these ideal statements the following distinguishing features of the continuum of clinical competence development are concluded:

FEATURE	UNIT CHARACTERISTIC		
	I	II	III
Role Perspective of Student	Student/Physician	Student-physician	Physician-student
Knowledge Base	Basic science; Pre-medical experience	Basic science; Basic medical science Pre-medical experience	Unit I and II Basic clinical medicine; Pre-medical experience
Focus of Clinical Learning	Orientation to health care delivery; Confirming procedural skills of H/P	Orientation to private practice; Refining H/P skills; Establishing criteria for normal; Confirming skills in patient interaction; Initiating problem solving approach Refine OMT skills	Orientation to hospital care; Refining interpretive skills; Developing problem solving skills; Learning management protocols; Learning technical skills
Professional Task Assignment	H/P	H/P; Diagnostic problem solving; OMT therapy	H/P; Diagnostic problem solving; Patient management problem solving
Level of Focus	Procedures	Patient interaction; Protocol mastery Data accuracy	Disease diagnosis and treatment; Health care management
Standard Bearer	Curriculum; Clinical faculty	Curriculum; Clinical faculty; Adjunct faculty	Curriculum; Adjunct faculty; Clinical faculty

Explicit in the ideal statements was the imposition of standards for clinical experience outcomes; whereas, implicit in all subjects' statements concerning their actual experiences was a lack of uniformity of outcomes, and the subjects' own responsibility for determining what outcomes will be sought.

Explanations for the variety of actual outcomes will be described in Chapter V, and implications of both the ideal and the actual competence statements will be explored in Chapter VI.

Summary

This chapter has presented the descriptive analysis of in-depth interviews of students at three levels of an osteopathic medical education program, with regard to three issues: the nature and influences of pre-medical clincial experiences and training on clinical competence development; abilities and deficiencies in performing profesisonal tasks at each of the three levels; and, descriptions of the continuum of clinical competence development.

Presented for each level of the program were the results of a content analysis of each interview, regarding the specific description of competence and deficiency in performing two major professional tasks: the medical history and physical examination, and diagnosis and management problem solving. Frequency counts of the coded responses, based on the pre-medical experiential background of the subject were presented, and coded responses for which there was substantial subject agreement were presented as a general statement for competence or deficiency for each level of training for both professional tasks. In a similar fashion, subjects' views of ideal competence were analyzed and presented.

In the cases of the actual clinical performance and the ideal, there are clear distinctions in clinical competence between and among each of the three levels of training in the program studied. The analysis also showed differences within groups, primarily based on subjects' pre-medical clinical experiences, but also on the nature of individual subject's clinical experiences in the medical school program. And, finally, the comparison of ideal and actual competence revealed differences both in the breadth and specificity of skills and knowledge underlying students' clinical competence, and in the students' perspectives on their professional development.

Chapter V will provide further insight into the continuum of clinical competence development by presenting students' perspectives of the explanations for their competence and deficiencies.

CHAPTER V

STUDENTS' PERCEPTIONS OF THE VARIABLES IN DEVELOPING CLINICAL COMPETENCE

This study had two primary purposes: (1) to describe, from the students' prespective clinical competence at each of three stages of an educational program for osteopathic medical students; and (2) to identify teaching/learning variables that influence the clinical competence developmental process. Chapter IV presented 37 osteopathic medical students' descriptions of their clinical competence. This chapter will present their insights into the process by which they developed that clinical competence.

In an effort to gain as specific information as possible about the teaching/learning process, subjects were asked in in-depth interviews to describe each formal clinical experience in which they participated in terms describing: what they did; what the clinical supervisory did; what characterized for them a "good" and "bad" clinical supervisor or clinical experience; what they could or could not do given certain conditions; what affect didactic preparation had on clinical performance; what affect clinical performance had on learning didactic information; and how they were evaluated.

Subjects' responses to these various questions are presented here under two major headings: (1) explanations for what was and wasn't described in Chapter IV as clinical competence, and (2) insights into the relationship of theory to practice. As in Chapter IV, the findings presented in this chapter are intended to present <u>students</u>' perceptions on the learning process. The investigator's impressions and insights will be presented in Chapter VI.

Unit I subject interviews were analyzed differently from those of the other two subject groups, due to the difference in interview process. Subjects having had medically-related training and experience (Category V) were asked to discuss the H/P skills of their less-experienced classmates and what they thought accounted for those skills. Category I-IV subjects were asked to describe their experiences, and reactions to them, in detail. Content analysis was used to identify (1) the key explanations offered by Category V subjects, and (2) supporting and/or refuting evidence in Category I-IV subjects' statements. The results of that analysis are presented in the text of the chapter.

Two analytic methods were used in codifying and interpreting the information gained through the Unit II and III subjects interviews. First, as in Chapter IV, descriptors of each subject's responses were obtained through content analysis. That is, responses to a particular issue (e.g., explanation for history and physical examination (H/P) competence), were recorded and then coded for each subject categorized by level of training and category of pre-medical experience. The Unit level descriptive composites are present as Exhibits H through M and the coded descriptors are presented in the text.

Second, tabulations were made of each subject's use of particular descriptors and then contingency matrices constructed. The resulting contingency tables were studied to identify patterns of associations of paired descriptors. The contingency tables were constructed for each issue using two sets of conditions. One table was constructed using <u>all</u> subjects within a given level of training. A second set of tables was constructed to determine whether pre-medical experience made any difference in the way subjects responded to questions. Experience in analyzing the interviews for Chapter IV led the investigator to suspect that the perspective of subjects having medically-related experiences would differ from that of other subjects. Initial examination of the Unit II tabulations showed that Category V subjects did use different descriptors and, therefore, contingency analyses for Unit II subjects compared Category V to Categories I-IV subjects. Similar examination of Unit III tabulations suggested that Category IV and V subjects differed from Categories I-III subjects in their responses, and, therefore, contingency analyses compared these two composite groups. Unfortunately, the small number of subjects makes the interpretations highly suspect. Given the exploratory nature of this study, interpretations are intended only to guide future research. It is in that spirit that highly speculative interpretations are included in this presentation. The Unit level contingency tables are presented as Exhibit O through T, and those comparing responses based on the students' pre-medical school experience are presented in the text where appropriate.

Explanations for Clinical Performance

Students at each of the three levels of the educational program under study were generally asked to describe what and how they performed in their clinical experiences, what they were expected and allowed to do by their preceptor, the nature of the clinical cases with which they worked, and how they would explain their level of performance. Questions were directed to the specific kinds of clinical experiences of the subject group. In addition, questions probed the particular experiences of the individual subjects and sought clarification of their responses to questions posed in the interview schedule.

Unit I

The focus of the interview of Unit I subjects was the series of three history and physical examinations performed in the final term of the Unit. Unit I students, as part of a three-course series in patient evaluation skills training, were assigned three experiences in which they perform a history and physical examination on individuals in a health care setting: two persons were hospitalized and one was participating in a senior citizen health screening project. Prior to these three experiences Unit I students had performed history and physical examinations on their peers in a simulated laboratory.

Although all Unit I subjects were asked to describe the details of the three H/P experiences, those subjects who had had medically-related training and experience prior to entering medical school were asked to reflect on the training program and the conditions of the three experiences, and to propose explanations for the performance of the typical Unit I student. The insights of these experienced students were then compared with the statements offered by the less experienced subjects.

Explanations for History and Physical Examination Competence: Experienced subjects proposed thirteen general explanations for H/P competence of the typical (medically-inexperienced) Unit I student, listed in Table 5.1.

Table 5.1

EXPLANATIONS FOR H/P COMPETENCE
OFFERED BY UNIT I SUBJECTS

(A) Uncomfortable in patient setting
(B) Certain skills not yet mastered (fundascopic, palpation, percussion, auscultation)
(C) Inexperience with variations in normal findings
(D) Inexperience with abnormal findings
(E) Lack of knowledge of clinical medicine
(F) H and PE too much for first experience
(G) Unable to tailor H/P to chief complaint
(H) Lack of experience using medical terminology
(I) Lack of training and experience writing up H/P
(J) Lack of specific evaluation of performance
(K) Lack of remediation of skills between experiences
(L) Lack of specific training in medical history taking
(M) Students don't take responsibility for professional development

The first seven of these explanations (A through G) can be considered to reflect conditions inherent in the initial level of clinical training. For example, students who demonstrate mastery of physical examination procedures in the simulation laboratory may very well appear "all thumbs" because of their uncomfortableness in clinical settings (A). On the other hand, experienced subjects unanimously concluded that the conditions under which their inexperienced classmates were expected to perform their hospital H/P exaccerbated this expected stress. For example, with the exception of one hospital, patients did not know that first year medical students would be performing history and physical examinations on them. Some patients refused and others had to be coaxed to participate. Also, most inexperienced students were unfamiliar with the organization of the hospital, wards and medical charts, and no orientation was provided at most hospitals. Too, in most instances, students were allowed to select patients from the admissions list. Some patients were inappropriate for inexperienced, unsupervised students--notably the 8 month old infant one student selected because he "had never done a pediatric exam." And, as was pointed to repeatedly in Chapter IV, knowledge of clinical medicine (E) is essential to being able to direct the H/P towards the medical problem at hand (G). Students in the program under study would not be exposed to the basics of clinical medicine until Unit II. Lack of knowledge of medicine created other practical problems for students. For example, one student's patient was normal except for an injured knee which was propped up on a pillow. As the student remarked:

> I was perplexed totally. I had no idea if she could bear weight; no idea if I could touch it; no idea if I could move it; didn't know if I should spend my energy looking at her knee or doing the physical. It is like doing a physical on someone who is bedridden. That was a pretty frustrating situation.

Also, these experienced subjects contend that inexperienced students are slow and, therefore, should not be expected to perform a complete H/P in one experience

(F)--at least for the sake of the patient. Experience, they say--both with a wide range of normal subjects (C) and those with pathology (D), is the key to being able to interpret the findings in the physical examination and gaining competence in the most troublesome procedures (B). That is, unless Unit I students have unlimited access to such a wide range of H/P subjects (and the time to practice), they can be expected to lack proficiency with the fundascopic, palpatory, percussion and auscultory procedures, and to be unable to accurately assess findings.

On the other hand, the remaining explanations (H through M) can be viewed, at least to some extent, as deficits of the training program. Specifically, subjects at all levels of the program reported that they had not been taught the principles of medical history taking (J), including systems review questions, although they had had extensive group work in principles of communication, interpersonal relations, and interviewing. In contrast, subjects who formerly were Physicians' Assistants (P.A.) claimed to have previously been taught a systematic H/P, including systems review which they continued to use throughout their medical training. Many inexperienced subjects reported seeking from these former P.A.s, advice on the conduct of the medical history.

Similarly, experienced subjects' perceptions regarding Unit I students' lack of experience using medical terminology and performing the H/P write-up (F and G, respectively) were confirmed by comments of inexperienced subjects:

> There was no requirement for a write-up and I didn't turn one in. At the Civic Center there was such a requirement for a write-up. There was no feedback on those.
>
> I would have liked more follow-up on the write-up. . . Where I found I didn't have to hand it in, I didn't write it up.
>
> I can't use medical terminology and feel O.K. about it.
>
> For example, [for] my second patient he [clinician] asked me what kinds of lung sounds I heard. I said, "I don't know--I know it was pathology;" and I described it in laymen's terms. And he said, "That's O.K. It's good you heard something."

Inexperienced subjects also confirmed that no one was immediately available to confirm findings (J). Experienced and inexperienced subjects recommended some mechanism for gaining immediate feedback. The following suggestion made by one inexperienced subject was typical:

> The supervisor needs to be immediately available--but not in the room. . . The supervisor needs to know the patient and be able to evaluate the accuracy of the findings. If significant findings are missed, the student and evaluator should discuss the findings and perhaps go into the patient's room and re-check findings and techniques.

This expressed need for immediate feedback and remediation was a constant theme in statements of students at all levels of the program. Without continual evaluation and guided remediation some students reasoned that they "must be doing O.K. because no one said anything," while others failed to develop the confidence necessary to assertively pursue their professional development. While some subjects described the feedback on skills in performance labs as being "good and non-threatening," others described it as being "unavailable" or "inconsistent." No one described having had feedback on skills when in the hospital setting, although some reported having asked for and receiving immediate confirmation of findings when they performed the senior citizen H/P.

It might be reasoned that the key to clinical competence development is the student's own responsible action (M), and that despite flaws in an educational program, the student, through his/her own sense of responsibility and initiative, can develop the essential competence. Whatever the degree of truth in that statement, the program can significantly constrain the student's best efforts to carry out that responsiblity. For example, Unit I subjects reported having considered a plan of preparation for their forthcoming clinical experiences. Most frequently, however, those plans were modified, often they were abandoned, because of the demands of the didactic program.

> I would have read my Malasantos [H/P textbook] if I hadn't had two exams that week.
>
> I was excited--I really wanted to do it, but I also think I was consumed with the thought of studying for the immunology exam--it was an extremely difficult academic term.
>
> [The debriefing] was very open. No one wanted to be there--we had a big test the next day. He was very congenial about letting us go home, which was all we wanted to do.

These students appear to have taken their cues for establishing learning priorities from the design of the program. As we noted in Chapter IV, Unit I subjects concluded that the clinical experiences "were no big deal." Here we see that they perceived their didactic courses to be most important. Only in retrospect, as experienced Unit I and advanced level subjects have shown, does the student understand the significance of those clinical experiences for his/her professional development. That is, naive students appeared not to have an a priori conceptual framework to guide their professional competence development. They assumed the educational program was designed to logically lead to professional competence if they met its (minimum) requirements.

Unit II

The focus for examining clinical competence at the Unit II level was the four-term series of preceptorships in private practice, ambulatory care settings. Two subjects groups were asked to consider their preceptorship experiences: those who had just or would shortly complete Unit II (Unit II subjects), and those who currently were interns and had several years previously completed the unit (Unit III subjects). Several different types of information were sought: descriptions of each preceptorship experience, opinions of what characterized a "good" and "bad" preceptor, and explanations for any discrepancies between what they felt they should be able to do and what they had described themselves as being able to do.

And since at the Unit II level it was presumed that students were engaged in performing history and physical examinations and also in diagnosis and treatment problem solving, questions were separately and specifically direced at each of these two major professional tasks.

Explanations for History and Physical Examination Competence: Unit II students offered fourteen (14) specific explanations for their Unit II H/P competence, while interns offered eight (8), as here seen in Table 5.2.

EXPLANATIONS FOR UNIT II H/P COMPETENCE
OFFERED BY UNIT II AND UNIT III SUBJECTS

Explanation	Percent Response UNIT II (n=11)		UNIT III (n=11)	
Got to do alot	(A)	82%	(B)	45%
Lots of cases with pathology	(B)	27	(A)	55
Was assertive/self-confident	(C)	73	-	
Had self-teaching goals	(D)	64	-	
Was taught "tricks of trade"	(E)	64	(E)	18
Got positive reinforcement	(F)	55	-	
Was honest about own skills	(G)	36	-	
Was given critical feedback	(H)	45	(F)	36
Had personal support system	(I)	9	-	
Supervisor had high expectations	(J)	9	(D)	9
Had requisite knowledge base	(K)	64	(C)	64
Non-threatening learning environment	(L)	9	-	
Was given responsibility	(M)	27	-	
Pre-medical experience/training	(N)	27	(H)	36
Supervisor had protocol for handling cases	-		(G)	9

(The explanations for competence offered by each Unit II subject are presented in Exhibit H and those for Unit III subjects are presented in Exhibit I.)

Generally, Unit II subjects explained their H/P competence in terms of two major variables: their own attributes (assertiveness, goal-directedness, and having the requisite knowledge) and clinical instruction (given opportunity to practice, taught the "tricks of the trade" and were given feedback). Specifically, their most common explanations were: (A) "got to do alot," (C) "was assertive/self-confident," (D) "had self-teaching goals," (F) "got positive reinforcement," and (K) "had requisite knowledge base." The majority of inexperienced subjects also cited (E) "taught tricks of the trade" and (H) "got critical feedback."

When one analyzes the contingency data for Category I-IV subjects (Table 5.3) by aligning co-occuring descriptors, one finds individual constellations of correlated statements. That is, there is no common set of descriptors offered by inexperienced students. (See Exhibit N for Unit II subject contingency table.) This phenomenon points up the highly idiosyncratic nature of the preceptorship experiences, as was suggested in Chapter IV. Each subject was faced with a different set of learning experiences, not only in terms of different preceptors, but what he/she wanted to do, was able to do and was allowed and guided to do. Hence, there are different sets of associated explanations for competence. For example, one student's set of associations showed the student's personal support system (I) common to a set of five otherwise unassociated explanations (D,E,F,G,H); another student's explanation revealed the non-threatening nature of the learning environment (L) to be the common association of four other explanations (E,F,G,H); yet another student placed receiving positive reinforcement (F) at the center of a set of otherwise unassociated explanations (C,E,G,L,H,I). This may suggest that inexperienced students at this level feel a particular need for a supportive learning environment.

Table 5.3

EXPLANATIONS FOR UNIT II COMPETENCE
DESCRIBED BY CATEGORY I-IV SUBJECTS

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
A	-	.30	.69	.59	.49	.59	.30	.49	.10	.10	.59	.10	.20	.10
B	**.33**	-	.26	.22	.18	.22	.11	.18	.04	.04	.22	.04	.07	.04
C	.66	**.33**	-	.52	.43	.52	.26	.43	.09	.09	.52	.09	.17	.09
D	.55	**.33**	**.66**	-	.37	.44	.22	.37	.07	.07	.44	.07	.15	.07
E	.44	0	.33	.22	-	.37	.18	.31	.06	.06	.37	.06	.12	.06
F	.55	.11	**.55**	.44	**.44**	-	.22	.27	.07	.07	.44	.07	.15	.07
G	.22	0	.22	.22	**.33**	**.33**	-	.18	.04	.04	.22	.04	.07	.04
H	.44	.11	.33	.33	**.33**	**.44**	**.22**	-	.06	.06	.37	.06	.12	.06
I	0	0	.11	**.11**	**.11**	**.11**	**.22**	**.11**	-	.01	.07	.01	.02	.01
J	**.11**	0	.11	-	**.11**	**.11**	0	0	0	-	.07	.01	.02	.01
K	**.66**	.22	.44	.33	.33	.44	.11	**.44**	0	**.11**	-	.07	.15	.07
L	**.11**	0	0	0	**.11**	**.11**	**.11**	**.11**	0	0	**.11**	-	.02	.01
M	**.22**	**.22**	**.22**	**.22**	0	**.11**	0	.11	0	0	.11	0	-	.02
N	**.11**	0	**.11**	.11	0	**.11**	0	**.11**	0	0	**.11**	0	0	-

In contrast, alignment of the contingencies for experienced subjects (Table 5.4) reveals a set of student-centered statements (C,D,G) associated with themselves and with "the opportunity to do alot" (A). Experienced subjects apparently view their competence to be dependent upon self-assertiveness, self-evaluation, and self-goals, in contrast to the inexperienced subjects' dependence on other-directed supportive learning environment. In fact, highly experienced students describe their clinical performance in the preceptorships as extensions of their former clinical role. And, in contrast to inexperienced students' descriptions of uncertainty in the clinical setting, the experienced students described considerable comfort and self-directedness, as revealed in this Unit II subject's statement:

> Maybe it is my clinical experience that gave me security in knowing some things and how to handle myself. There were things I have been doing for five years in the ER--history taking--that I knew I could do and I could feel comfortable telling the preceptor that I could do that. Something in my experience and personality that made me comfortable that I had something to offer and that would be the place from which I would start.

Table 5.4
EXPLANATIONS FOR UNIT II COMPETENCE
DESCRIBED BY CATEGORY V SUBJECTS *

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
A	-	0	.25	.25	0	0	.25	0	0	0	.25	0	.25	.50
B	0	-	0	0	0	0	0	0	0	0	0	0	0	0
C	**.50**	0	-	.25	0	0	.25	0	0	0	.25	0	.25	.50
D	**.50**	0	**.50**	-	0	0	.25	0	0	0	.25	0	.25	.50
E	0	0	0	0	-	0	0	0	0	0	0	0	0	0
F	0	0	0	0	0	-	0	0	0	0	0	0	0	0
G	**.50**	0	**.50**	**.50**	0	0	-	0	0	0	.25	0	.25	.50
H	0	0	0	0	0	0	0	-	0	0	0	0	0	0
I	0	0	0	0	0	0	0	0	-	0	0	0	0	0
J	0	0	0	0	0	0	0	0	0	-	0	0	0	0
K	0	0	0	0	0	0	0	0	0	0	-	0	.25	.50
L	0	0	0	0	0	0	0	0	0	0	0	-	0	0
M	**.50**	0	**.50**	**.50**	0	0	**.50**	0	0	0	0	0	-	.50
N	.50	0	.50	.50	0	0	.50	0	0	0	.50	0	.50	-

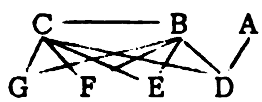
Similarly, one intern, a former Physician's Assistant, described his Unit II preceptorship experiences as " welcomed relief" from school.

* Bold type indicates actual correlation coefficients which exceed expected correlation coefficients.

As also shown in Table 5.2, when Unit III subjects (interns) reflected on their Unit II experiences and H/P performance, they used explanations that were similar to those of Unit II subjects. Their most common explanations were: "got to do alot" (B); "worked with lots of cases" (A); and "had the requisite knowledge" (C); more than a third also cited "was given critical feedback" (F). Only experienced subjects (Categories IV and V) cited "pre-MSU-COM training and experience" (H). All but one of the explanations offered by interns had been offered by Unit II subjects. Interns, however, did not offer certain subjective explanations ("was assertive," "had self-teaching goals," "was honest about skills," "non-threatening learning environment") offered by Unit II subjects.

It must be kept in mind that, as we observed in Chapter IV, Unit III subjects tended to view the medical history and physical examination as an integral part of the medical problem solving process. Thus, their explanations should not be seen as explanations for having attained some level of technical competence in the H/P, but more likely for developing more finesse in organizing the H/P to "fit the problem at hand" and interpreting results.

Interns, like Unit II subjects, proffered explanations which differed depending upon the subject's pre-medical experience. (See Exhibit P for composite Unit III subject contingency table.) For Category I-III subjects, competence explanations were associated either with "had requisite knowledge" (C) or "got to practice alot" (B), which in turn were associated with each other: (See Table 5.5)



These contingencies suggest that systems knowledge and practice associated with explicit clinical teaching and feedback are central to <u>inexperienced</u> students' development of H/P competence. On the other hand, for experienced subjects (Category IV and V) competence is associated with <u>doing</u>, seeing a lot of cases of a type, and having an opportunity to practice, which is supported by prevous knowledge enhanced by systems biology courses, as Table 5.6 reveals. The significant associations can be aligned:

$$\begin{array}{ccccc} H & — & B & — & F \\ & & | & & \\ & & A & — & C \end{array}$$

That is, experienced students associated their clinical competence with personal goals and efforts, rather than with instructional guidance from preceptors.

Table 5.5

EXPLANATIONS FOR UNIT II COMPETENCE
OFFERED BY CATEGORY I-III UNIT III SUBJECTS

	A	B	C	D	E	F	G	H
A	-	.33	.42	.09	.17	.17	.09	0
B	.33	-	.55	.11	.22	.22	.11	0
C	.33	**.66**	-	.14	.27	.27	.14	0
D	**.17**	**.17**	**.17**	-	.06	.06	.03	0
E	.17	**.33**	**.33**	0	-	.11	.06	0
F	.17	**.33**	**.33**	0	**.33**	-	.06	0
G	0	**.17**	**.17**	0	**.17**	**.17**	-	0
H	0	0	0	0	0	0	0	0

Table 5.6

EXPLANATIONS FOR UNIT II COMPETENCE
OFFERED BY CATEGORY IV-V UNIT III SUBJECTS

	A	B	C	D	E	F	G	H
A	-	.12	.24	0	0	.24	0	.48
B	**.20**	-	.08	0	0	.08	0	.16
C	**.40**	0	-	0	0	.16	0	.32
D	0	0	0	-	0	0	0	0
E	0	0	0	0	-	0	0	0
F	.20	**.20**	0	0	0	-	0	.32
G	0	0	0	0	0	0	-	0
H	.40	**.20**	0	0	0	.20	0	-

Explanations for <u>deficiencies</u> in Unit II history and physical examination skills were equally as variable as the explanations for competence. Unit II subjects offered twelve (12) explanations for deficiencies, and interns also offered twelve explanations. Table 5.7 presents the explanations for both groups of subjects.

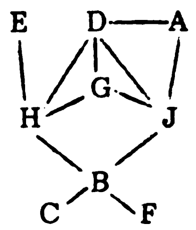
Table 5.7

EXPLANATIONS FOR UNIT II H/P CLINICAL SKILL DEFICIENCIES
OFFERED BY UNIT II AND UNIT III SUBJECTS

Explanation	Percent Response of Subjects UNIT II		UNIT III	
Little pathology in available cases	(A)	45%	(G)	45%
No repetition or practice	(B)	73	(A)	45
No patient follow-up	(C)	9	(H)	9
Didn't have requisite knowledge	(D)	36	*	
Psychological stress/intimidation	(E)	45	@	
Too few patients in practice	(F)	9	-	-
Too many patients in practice	(G)	45	(E)	9
No personal interest	(H)	9	(D)	9
Not encouraged to do	(I)	9		-
No feedback from clinical supervisor	(J)	27	(C)	9
No consistent modelling	(K)	9	(I)	18
Poor MSU-COM training	(L)	18	(F)	64
No previous training or experience		-	(B)	9
Systems course out of sync with practice		-	*(J)	82
No outside reading assigned		-	(K)	9
Supervisor didn't know student level		-	@(L)	9

Only one explanation, "no repetition or practice" (B) was offered by more than half of the Unit II subjects; however, at least one-third of all Unit II subjects offered explanations A,B,E, and G. Only Category V subjects in this group offered explanations K and L. Unit II subjects appear to pose two generic explanations for skill deficiencies, (1) insufficient practice, reflected in explanations B,E,F,G,H, and J; and (2) unproductive practice, reflected in explanations A,C,D,I,K, and L.

When the associations between explanations for deficiencies in the H/P expressed by experienced and inexperienced Unit II subjects are compared, we can see different correlations. (See Exhibit R for correlations of all Unit II subjects.) As seen in Table 5.8, inexperienced subjects most frequently described their deficiencies with four key explanations: "no repetition/practice" (B); "no interest" (H); "no feedback" (J); and, "don't have requisite knowledge" (D). The relationship of significant correlations can be shown as follows:



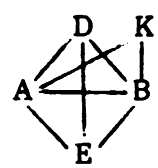
These associations suggest that inexperienced students perceive a need for coherent, structured clinical instruction--what subjects seem to be referring to when they describe a good clinical rotation as being "academic." This interpretation is consistent with the previous interpretation of these students explanation for their competence.

Table 5.8

EXPLANATIONS FOR UNIT II DEFICIENCIES
OFFERED BY CATEGORY I-IV UNIT II SUBJECTS

	A	B	C	D	E	F	G	H	I	J	K	L
A	-	.34	.05	.15	.20	.05	.20	.05	.05	.05	0	0
B	.22	-	.09	.26	.34	.09	.34	.09	.09	.09	0	0
C	**.11**	**.11**	-	.04	.05	.01	.05	.01	.01	.01	0	0
D	**.22**	.22	**.11**	-	.15	.04	.15	.04	.04	.04	0	0
E	.11	.22	**.11**	.11	-	.05	.20	.05	.05	.05	0	0
F	0	**.11**	0	0	**.11**	-	.01	.01	.01	.01	0	0
G	.11	.33	0	**.22**	.11	0	-	.05	.05	.05	0	0
H	0	**.11**	0	**.11**	**.11**	0	**.11**	-	.01	.01	0	0
I	0	0	0	0	**.11**	0	0	0	-	.01	0	0
J	**.22**	**.22**	0	**.11**	0	0	**.22**	0	0	-	0	0
K	0	0	0	0	0	0	0	0	0	0	-	0
L	0	0	0	0	0	0	0	0	0	0	0	-

In contrast, Unit II subjects with prior medically-related training and experience expressed few significantly correlated explanations for their H/P deficiencies, as seen in Table 5.9. The relationship of the five explanations: "little pathology" (A), "no repetition/practice" (B), "lack of requisite knowledge" (D), "psychological stress" (E) and "lack of modeling" (K), can be described:



Experienced subjects, in contrast to inexperienced subjects, expressed the need/ want for role-modeling, practice, cases with pathology and the requisite knowledge, but seemed not to need/want formal clinical instruction. This interpretation is compatible with their explanations for competence described earlier; i.e., "they were able to do a lot." These data suggest that experienced students perceive themselves as needing limited guidance (in the form of role-modeling), but extensive practice with patients with disease.

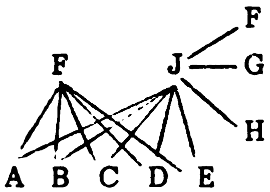
Table 5.9

EXPLANATIONS FOR UNIT II DEFICIENCIES
OFFERED BY CATEGORY V UNIT II SUBJECTS

	A	B	C	D	E	F	G	H	I	J	K	L
A	-	.25	0	.25	.25	0	.25	0	0	0	.25	.50
B	.50	-	0	.25	.25	0	.25	0	0	0	.25	.50
C	0	0	-	0	0	0	0	0	0	0	0	0
D	.50	.50	0	-	.25	0	.25	0	0	0	.25	.50
E	.50	.50	0	.50	-	0	.25	0	0	0	.25	.50
F	0	0	0	0	0	-	0	0	0	0	0	0
G	0	0	0	0	0	0	-	0	0	0	.25	.50
H	0	0	0	0	0	0	0	-	0	0	0	0
I	0	0	0	0	0	0	0	0	-	0	0	0
J	0	0	0	0	0	0	0	0	0	-	0	0
K	.50	.50	0	.50	0	0	0	0	0	0	-	.50
L	.50	.50	0	.50	0	0	.50	0	0	0	.50	-

Although interns (Unit III subjects) cited very similar explanations for their Unit II clinical performance deficiencies, as previously shown in Table 5.7, their most common explanations differed from those of Unit II subjects. More than half of the interns faulted the MSU-COM training program's lack of differential diagnosis training (F) and the lack of syncrony of the systems courses with the cases they encountered (J). More than a third of these subjects also cited "little or no practice" (A) and "little pathology in available cases" (G) as explanations for deficiencies. Again, it should be pointed out that these explanations are consistent with these advanced students' perspective that the H/P is an integral part of the medical problem solving process.

When their associations of explanations are examined, as revealed in Table 5.10, we see that Unit III subjects, in contrast with those currently completing Unit II, did not associate clinical supervisor behaviors (creating psychological stress or not encouraging students to perform) with their clinical performance deficiencies; instead, these advanced students appeared to hold the educational program on campus accountable:

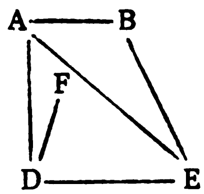


Experienced Unit II subjects also had cited "poor MSU-COM training" as an explanation, whereas none of the inexperienced subjects expressed that explanation. This may suggest that individuals experienced in the realities of clinical training don't make the same assumptions about what can be expected from off-campus clinical instructors as do inexperienced students.

Table 5.10
EXPLANATIONS FOR UNIT II DEFICIENCIES
OFFERED BY UNIT III SUBJECTS

	A	B	C	D	E	F	G	H	I	J	K	L
A	-	.04	.04	.04	.04	.29	.20	.04	.08	.37	.04	.04
B	**.09**	-	.008	.008	.008	.06	.04	.008	.016	.07	.008	.008
C	.00	.00	-	.008	.008	.06	.04	.008	.016	.07	.008	.008
D	**.09**	**.09**	.00	-	.008	.06	.04	.008	.016	.07	.008	.008
E	**.09**	**.09**	.00	**.09**	-	.06	.04	.008	.016	.07	.008	.008
F	**.36**	**.09**	**.09**	**.09**	**.09**	-	.29	.06	.12	.52	.06	.06
G	.18	.00	.00	.00	.00	.18	-	.04	.08	.37	.04	.04
H	.00	.00	.00	.00	.00	.00	**.09**	-	.016	.07	.008	.008
I	.00	.00	.00	.00	.00	.00	**.09**	**.09**	-	.15	.016	.016
J	**.45**	**.09**	.00	**.09**	**.09**	**.55**	**.45**	**.09**	.09	-	.07	.07
K	.00	.00	.00	.00	.00	.00	**.09**	**.09**	**.09**	**.09**	-	.008
L	**.09**	.00	.00	.00	.00	**.09**	.00	.00	.00	**.09**	.00	-

Further analysis of the explanations for deficiencies offered by the Unit III subjects, based on the student's pre-medical experience, reveals that the previous interpretation may be somewhat misleading. As shown in Table 5.11, inexperienced (Category I-III) subjects did not associate the lack of syncrony of the systems courses with other explanations, although lack of training in differential diagnosis was associated with other explanations. The conditions for clinical learning: "too many patients" (E), "little practice" (A), "little pathology" (G), "no follow-up" (H), "inconsistent modeling" (I) and "no outside reading assigned" (K) were reported by these subjects, as they were by Unit II inexperienced subjects. The significant associations can be expressed:



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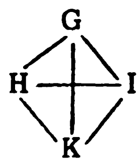

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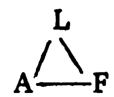

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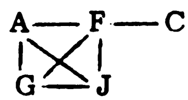
Experienced (Category IV - V) Unit III subjects, on the other hand, associated fewer explanations for their deficiencies. As seen in Table 5.12, explanations A ("little practice"), F ("poor MSU-COM training"), G ("little pathology)) and J ("systems courses out of sync") were correlated with one another as follows:



These analyses suggest that pre-medical experience persists in distinguishing students regardless of their level of training in the formal program. While clinical experience within the educational program appeared to change the perspective from which students viewed their clinical performance, pre-medical school experience remained an important variable in students' perceptions of their medical school training program. It is likely that an actual "learning lag time" distinguishes the experiential groups. The most <u>inexperienced</u> students were still refining skills which more experienced students mastered at the previous level of training.

Table 5.11

ASSOCIATIONS OF EXPLANATIONS FOR UNIT II DEFICIENCIES OFFERED BY CATEGORY I - III UNIT III SUBJECTS

	A	B	C	D	E	F	G	H	I	J	K	L
A	-	.085	0	.085	.085	.25	.333	.085	.085	.50	.085	.085
B	.17	-	0	.029	.029	.085	.11	.029	.029	.17	.029	.029
C	0	0	-	0	0	0	0	0	0	0	0	0
D	.17	.17	0	-	.029	.085	.11	.029	.029	.17	.029	.029
E	.17	.17	0	.17	-	.085	.11	.029	.029	.17	.029	.029
F	.333	.17	0	.17	.17	-	.333	.085	.085	.50	.085	.085
G	.17	0	0	0	0	.17	-	.11	.11	.666	.11	.11
H	0	0	0	0	0	0	.17	-	.029	.17	.029	.029
I	0	0	0	0	0	0	.17	.17	-	.17	.029	.029
J	.50	.17	0	.17	.17	.50	.666	.17	.17	-	.17	.17
K	0	0	0	0	0	0	.17	.17	.17	.17	-	.029
L	.17	0	0	0	0	.17	0	0	0	.17	0	-

Table 5.12

ASSOCIATIONS OF EXPLANATIONS FOR UNIT II DEFICIENCIES OFFERED BY CATEGORY IV - V UNIT III SUBJECTS

	A	B	C	D	E	F	G	H	I	J	K	L
A	-	0	.08	0	0	.32	.08	0	.08	.24	0	0
B	0	-	0	0	0	0	0	0	0	0	0	0
C	0	0	-	0	0	.16	.04	0	.04	.12	0	0
D	0	0	0	-	0	0	0	0	0	0	0	0
E	0	0	0	0	-	0	0	0	0	0	0	0
F	.40	0	.20	0	0	-	.16	0	.16	.48	0	0
G	.20	0	0	0	0	.20	-	0	.04	.12	0	0
H	0	0	0	0	0	0	0	-	0	0	0	0
I	0	0	0	0	0	0	0	0	-	.12	0	0
J	.40	0	0	0	0	.60	.20	0	0	-	0	0
K	0	0	0	0	0	0	0	0	0	0	-	0
L	0	0	0	0	0	0	0	0	0	0	0	-

Explanations for Diagnosis and Patient Management Competence: Chapter IV presented data from which it was concluded that Unit II students develop a basic level of competence in diagnosis: know the criteria for identifying normal and abnormal findings in the H/P; can identify the chief complaint; can correctly identify the associated body system(s); and can propose a short list of possible problems which are congruent with the clinical data. Their competence in management is primarily a matter of recalling and applying treatment protocols used by the preceptor. Unit II subjects offered seventeen explanations for having attained this competence, as shown in Table 5.13.

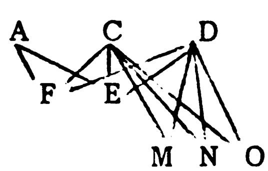
Table 5.13

EXPLANATIONS FOR DIAGNOSIS AND PATIENT MANAGEMENT COMPETENCE OFFERED BY UNIT II SUBJECTS

	Explanation	Percent Response by Experience Category					
		I (n=4)	II (n=4)	III (n=0)	IV (n=1)	V (n=2)	ALL
A	Some CPSS's provided problem-solving strategy	75	25	-	0	0	36
B	Some CPSS's provided therapy regimen	50	0	-	0	0	18
C	Quality of some systems courses	75	0	-	100	0	36
D	Personal effort to learn	75	25	-	100	50	54
E	Seeing patient-case increases memory	50	25	-	100	0	36
F	Use clincial medicine manual	25	0	-	0	0	9
G	Cumulative knowledge of systems courses	0	25	-	0	50	18
H	Assertiveness in clinical setting	0	25	-	0	50	18
I	Recency of pertinent systems course	0	25	-	0	0	9
J	Good clinical role model	0	50	-	0	0	18
K	Pre-MSU-COM training/experience	0	25	-	0	0	0
L	Help from patients with chronic illness	0	25	-	0	0	0
M	Worked up cases in particular system	0	0	-	100	50	18
N	Developed personal clinical notebood	0	0	-	100	50	18
O	Repetition of clinical cases increases memory	0	0	-	100	0	9
P	Can recognize abnormalities	0	0	-	0	50	9
Q	Patient follow-up	0	0	-	0	50	9

There is little common ground among these various explanations across subjects. Only (D), "personal effort to learn" was cited by at least one-half of the Unit II subjects; and one-third cited (A), "some CPSS's provided problem-solving strategy," (C), "quality of some systems courses;" and (E) "seeing patient-case increases memory."

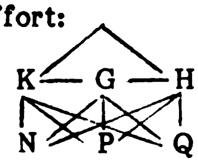
When one examines the ways in which the Unit II subjects associated these explanations, differences are seen between experiential subject grops. As Table 5.14 shows, inexperienced subjects (Category I-III) associated systems knowledge (A,C) and personal efforts (D) with other explanations:



(See Exhibit R for correlations of explanations for all subjects.) Many of the inexperienced subjects noted that they tried to get the case at hand to "fit" their existing knowledge base, particularly the information being gained in the current systems course. For example, when they have had the relevant systems course they have more critical questions to pursue in the H/P and máy have, depending upon the systems course in question, an approach to problem solving, including a short problem list and notions about applicable drug therapy.

These inexperienced students' explanations for medical problem solving competence seem to differ in perspective from those they gave for their history and physical examination competence. In the case of H/P competence these subjects' explanations were very idiosyncratic, and their explanations for their deficiencies focused on the nature of the instructional environment. Here, in the case of medical problem solving competence, their explanations seem to center around the their own didactic preparation and its congruence with the clinical cases they confronted. Subjects cited only one explanation that directly credited the clinical instructor for their competence (J) "good clinical role model," and only two subjects cite this explanation.

In contrast, the Category V subjects associated competence with their empirical knowledge and person effort:



That is, rather than beginning with systems knowledge in an attempt to understand the problem at hand, experienced students started with empirical knowledge they had previously gained, and elaborated it with information gained in the systems courses. Even if they had not had the relevant systems course, they had sufficient empirical knowledge to give them a sense of confidence and competence.

Table 5.14 shows that Unit II subjects' explanations for deficiencies in the diagnosis and patient management were also highly variable.

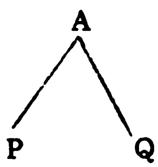
Table 5.14

EXPLANATIONS FOR DIAGNOSIS AND PATIENT MANAGEMENT DEFICIENCIES OFFERED BY UNIT II SUBJECTS

	Explanation	Percent Response by Experience Category					
		I (n=4)	II (n=4)	III (n=0)	IV (n=1)	V (n=2)	All Subjects
A	Short or poor systems course	25	0	-	100	50	27
B	Unconstructive clincial instruciton	25	25	-	0	0	18
C	Crammed for systems course exams	25	25	-	0	0	18
D	Not taught to problem solve	50	25	-	100	50	45
E	Ideologic conflicts	25	0	-	0	0	9
F	No good role model	25	0	-	0	0	9
G	Delay in applying systems knowledge	25	0	-	0	0	9
H	Easier to look up drugs than memorize	25	25	-	0	0	18
I	No patient follow-up	0	25	-	0	0	9
J	Lack of knowledge of disease	0	25	-	0	0	9
K	No feedback on write-ups	0	25	-	0	0	9
L	Lack of confidence in knowledge	0	25	-	0	0	9
M	Common diseases not presented in systems courses	0	25	-	0	0	9
N	Program confused about its goals	0	25	-	0	0	9
O	Finished preceptorships with only three systems courses	0	25	-	0	0	9
P	Fast pace of practice	0	25	-	100	0	18
Q	Did not work-up case in that system	0	0	-	100	100	27
R	Am passive in clinical situation	0	0	-	0	50	9
S	Quality of CPSS's variable	0	0	-	0	100	18
T	Selective learning	25	25	-	0	50	27

As can be seen, no explanation was cited by at least one-half of the subjects. "Not taught to problem solve" (D) was the most frequently cited explanation, being offered by 45 percent of the subjects. In fact, references to the program design (A,C,D,G,J,K,M,N,O,Q,S) were twice as often cited as the explanation for deficiencies as were references to either the nature of the clinical instruction/experience (B, F, I, P) or personal behavior (E, H, L, R, P).

When one examines the associations of explanations offered by these Unit II students, numerous patterns emerge, most of which have a single explanation in common. Just as we saw in examining explanations for history and physical examination competence, inexperienced subjects appear to make individually unique associations, all of which differ from those of experienced subjects. Specifically, as Table 5.15 supports, inexperienced subjects make associations of their explanations which can be described:

(1) 

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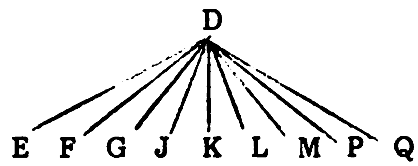
(2) 

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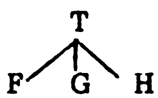
(3) 

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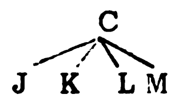
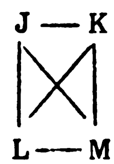
(4) 

,

and one interrelated set of associations:

(5) 

All of these associations point up the centrality of systems course instruction in students' ability to diagnose and propose patient management plans.

The experienced subjects (Categoy V) offer a single set of interrelated association, as Table 5.16 reveals:

,

which also focus on the importance of the system biology courses in the students' ability to solve medical problems.

(See Exhibit S for the correlations of explanations offered by all Unit II subjects.)

Table 5.15

ASSOCIATIONS OF EXPLANATIONS FOR DEFICIENCIES
IN UNIT II DIAGNOSTIC AND PATIENT MANAGEMENT COMPETENCE
OFFERED BY CATEGORY I - IV UNIT II SUBJECTS

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
A	-	.05	.05	.10	.025	.025	.025	.05	.025	.025	.025	.025	.025	.025	.025	.025	.025	0	0	.025
B	.11	-	.05	.10	.025	.025	.025	.05	.025	.025	.025	.025	.025	.025	.025	.025	.025	0	0	.025
C	0	0	-	.10	.025	.025	.025	.05	.025	.025	.025	.025	.025	.025	.025	.025	.025	0	0	.025
D	0	0	.11	-	.05	.05	.05	.10	.05	.05	.05	.05	.05	.05	.05	.05	.05	0	0	.05
E	0	0	0	.11	-	.012	.012	.025	.012	.012	.012	.012	.012	.012	.012	.012	.012	0	0	.012
F	0	0	0	.11	0	-	.012	.025	.012	.012	.012	.012	.012	.012	.012	.012	.012	0	0	.012
G	0	0	0	.11	0	.11	-	.025	.012	.012	.012	.012	.012	.012	.012	.012	.012	0	0	.012
H	0	.11	0	.11	0	.11	.11	-	.025	.025	.025	.025	.025	.025	.025	.025	.025	0	0	.025
I	0	.11	0	0	0	0	0	.11	-	.012	.012	.012	.012	.012	.012	.012	.012	0	0	.012
J	0	0	0	.11	.11	0	0	0	0	-	.012	.012	.012	.012	.012	.012	.012	0	0	.012
K	0	0	.11	.11	0	0	0	0	0	.11	-	.012	.012	.012	.012	.012	.012	0	0	.012
L	0	0	.11	.11	0	0	0	0	0	.11	.11	-	.012	.012	.012	.012	.012	0	0	.012
M	0	0	.11	.11	0	0	0	0	0	.11	.11	.11	-	.012	.012	.012	.012	0	0	.012
N	0	0	0	0	0	0	0	0	0	0	0	0	0	-	.012	.012	.012	0	0	.012
O	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	.012	.012	0	0	.012
P	.11	0	0	.11	0	0	0	0	0	0	0	0	0	0	.11	-	.012	0	0	.012
Q	.11	0	0	.11	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	.012
R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0
T	0	0	0	0	0	.11	.11	.11	.11	0	0	0	0	0	0	0	0	0	0	-

Table 5.16

ASSOCIATIONS FOR EXPLANATIONS OF DEFICIENCIES
IN UNIT II DIAGNOSTIC AND PATIENT MANAGEMENT COMPETENCE
OFFERED BY CATEGORY V UNIT II SUBJECTS

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
A	-	0	0	.25	0	0	0	0	0	0	0	0	.25	0	0	0	.50	.25	.50
B	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D	.50	0	0	-	0	0	0	0	0	0	0	0	.25	0	0	0	.50	.25	.50
E	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0
G	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0
H	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0
I	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0
J	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0
K	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0
L	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0
M	.50	0	0	.50	0	0	0	0	0	0	0	0	-	0	0	0	.50	.25	.50
N	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0
O	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0
Q	.50	0	0	.50	0	0	0	0	0	0	0	0	.50	0	0	0	-	.50	1.00
R	.50	0	0	.50	0	0	0	0	0	0	0	0	.50	0	0	0	.50	-	.50
S	.50	0	0	.50	0	0	0	0	0	0	0	0	.50	0	0	0	1.00	.50	-
T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

In summary, certain generalizations about the variables affecting Unit II students' clinical competence were supported by students' interview comments:

1. Students do not have a common understanding of the goal of the preceptorship clinical experiences or a comprehensive view of their clinical competence development by which they direct their clinical experiences.

2. The nature of the professional task and the clinical experience of the student influence the perceptions of the necessary conditions for developing clinical competence.

3. Students without extensive medically related, pre-medical school experience associate their history and physical examination competence with practice and guidance from the preceptor; whereas, the experienced students associate that competence with their previous training and opportunity to work with patients who have disease/pathology.

4. Competence in diagnosing and managing medical problems is seen by all students to be largely dependent on the theoretical information gained from systems biology courses. Inexperienced students also expect preceptors to continue and reinforce this instruction; whereas, experienced students expect preceptors to model clinical problem solving and to allow the student to work-up medical problems.

5. Inexperienced students are more dependent than experienced students upon supportive clinical instruction, including extensive supportive feedback, guided learning, and explication of the medical problem solving process.

6. Experienced students, more so than inexperienced students, view the H/P as an integral part of medical problem solving, and, therefore, associate their H/P competence with preparation in the systems biology courses.

7. As students proceed through the educational program they gain increased insight into the potential for clinical competence development that was offered by previous clinical experiences.

Students' perceptions of instruction in the clinical environment and their personal goals for the preceptorship provide further insight into those conclusions.

<u>The nature of clinical experiences</u>: As has been repeatedly pointed out, students have widely varying experiences in their preceptorships. The subjects of this study to some extent guided the process by which preceptors were assigned. They were provided with an opportunity to review student evaluations of preceptorships and to present a list to program administrators of preferred preceptors for each of their four preceptorship experiences. Preceptors were then assigned presumably taking into account the students' preferences, availability of the physician, and priority commitments to the Unit III Junior Partner program. In an attempt to gain some insight into how students perceived the preceptorship program and its contribution to their clinical competence, students were asked to describe the criteria by which they established their preferences. They were then asked to describe each preceptorship in terms of what they did, what they were asked to do, what instructional techniques the clinician used, and what their notions were of a "good" preceptor.

As one examines the students' criteria for preceptor selection, presented in Table 5.17, it is apparent that few students had a clear idea of a continuum of clinical competence. None described having undertaken a personal assessment of knowledge and skills and establishing goals directed towards expanding those skills or knowledge. In the first preceptor they sought someone "who would be patient," "would teach," and who other students had said was "O.K." More often than not, location became the deciding factor. Students continued in their subsequent preceptor selections to use their peer group for advice on who is a "good" preceptor, but they soon found that their personal goals might not jibe with those of the student-evaluator. They then sought advice from more select peers or asked more specific questions. They also sought increasing amounts of responsibility for patient interaction and care. Ultimately, it was the didactic program that dictated their selection choices. During school terms with especially difficult academic

Table 5.17

PERCENTAGE OF UNIT II STUDENTS SEEKING CERTAIN FEATURES OF PRECEPTORSHIP

NATURE OF STUDENT GOALS	PRECEPTORSHIP/EXPERIENCE CATEGORY																			
	#1					#2					#3					#4				
	I	II	III	IV	V	I	II	III	IV	V	I	II	III	IV	V	I	II	III	IV	V
Broad experience	25	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
See patients alone/responsible	25	0	-	0	0	0	25	-	100	50	25	0	-	0	50	50	50	-	0	100
Go slow/observe	50	25	-	100	0	0	50	-	100	0	0	25	-	100	0	0	50	-	100	0
Have good teacher	50	25	-	100	0	0	50	-	100	0	0	25	-	100	0	0	50	-	100	0
Little traveling	25	25	-	0	0	25	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Students recommended D.O.	50	75	-	100	50	50	50	-	0	0	25	50	-	0	0	25	75	-	0	0
Woman D.O.	0	25	-	0	0	25	0	-	0	0	25	25	-	0	0	25	0	-	0	0
Specific location	0	25	-	0	50	25	75	-	0	50	25	50	-	0	50	25	25	-	0	50
Specific type of practice	25	25	-	0	0	25	25	-	100	0	0	50	-	100	0	25	50	-	100	0
OMT integrated in practice	0	25	-	0	0	0	25	-	0	0	0	25	-	0	0	0	25	-	0	0
No criteria	0	0	-	0	50	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
Gain specific skills	0	0	-	0	0	0	0	-	0	0	25	0	-	0	0	25	0	-	0	0
Intensive	0	0	-	0	0	0	75	-	0	50	0	25	-	0	50	50	50	-	0	0

courses, students frequently elected "intensives" (concentrated 40-hour experiences taken during vacation periods) in order to make more time available during the regular term, or, preceptors within short driving distance to conserve time. There were as many subjects who thought the preceptorships valuable as thought them to be "more of a hassle than benefit."

For some the disappointment of not getting preferred preceptors, influenced their subsequent efforts to carefully select their priorities. In fact, few subjects, with the exception of those choosing "intensives," reported ever having gotten their preference, and few reported having gotten preceptors who offered what they sought, although a large proportion reported having had good experiences. There is one interesting consequence of the mismatch of goals and assignment. Students who had sought an observational role in their first experience but were placed with someone who placed high performance demands on them, concluded in retrospect that they were glad that they had been pushed harder than they preferred, even though it had been stressful at the time. And these students did not seek an observational role thereafter.

It is also clear that the amount of a student's accumulated knowledge and/or skills was not predictive of what the preceptor would expect of the student or allow him/her to do. As Table 5.18 reveals, a first-term Unit II student might be expected to independently conduct a history and physical examination of the chief complaint, arrive at a tentative diagnosis and even propose drug therapy, and yet in his/her last term the same student might be allowed only to "coat-tail" (observe).

It appears that personality outweighed pre-medical experience and training in determining how students approached their clinical experiences. For example, one student with considerable training in a medically-related occupation assumed a totally passive role in the preceptorships and never was given responsibility for

Table 5.18

PERCENTAGE OF SUBJECTS REPORTING PRECEPTORSHIP ACTIVITY

NATURE OF STUDENT ACTIVITY	PRECEPTORSHIP/STUDENT EXPERIENCE CATEGORY																			
	#1					#2					#3					#4				
	I	II	III	IV	V	I	II	III	IV	V	I	II	III	IV	V	I	II	III	IV	V
Slow/observation	25	25	-	0	50	0	0	-	0	0	0	0	-	0	0	50	0	-	0	0
Independent H/P	50	25	-	100	0	50	25	-	0	0	50	0	-	0	50	25	0	-	0	50
Expected to propose diagnosis	0	25	-	100	-	25	25	-	0	0	0	0	-	0	50	0	0	-	0	50
Expectations beyond students goal	25	50	-	100	0	25	25	-	0	50	0	25	-	0	0	25	0	-	0	0
Self-guided learning objectives	0	0	-	0	50	25	0	-	0	50	25	0	-	0	50	25	25	-	0	100

working up a patient. When asked what he would have done if the first preceptor had made him go in alone and work-up the patient, he replied:

> I would have panicked the first week. I would have started carrying around more books in the second week; and I would have started functioning. Even though I am passive I will adapt to anything. I would have felt insecure with such a limited knowledge base, but would have had a willingness to try.

The adaptability of the subjects was a predominant feature of their descriptions of their clinical performances. Students reported challenging clinicians on their therapeutic regiment or diagnosis, for example, only to the extent that it appeared to be acceptible or encouraged by the preceptor. Only one subject reported that, while she was merely trying to learn the clinician's treatment protocol, the preceptor expected her to propose a treatment plan of her own design, based on what she knew and could research. Some students, rather than seek an explanation from the clinician for his/her diagnosis or treatment, complied with what appeared to be established protocols and, then made judgments about the competence of the preceptor based on information that had been presented in systems courses.

This "do-what-they-do" approach to preceptorship experiences seemed to dominate student thinking throughout Unit II. It is in retrospect that students realize that the preceptorships had given them an opportunity to refine their skills and to apply theoretical knowledge, competence that they would shortly need in Unit III. At the outset, Unit II students seem to have harbored the notion/expectation that preceptors were extensions of the campus faculty who would teach and refine students' H/P skills, and show them how to apply their classroom knowledge to the solving of medical problems. In fact, some preceptors did that and they were described as "good" preceptors. The description of a "good" preceptor was consistent, as was that of a "bad" preceptor:

Good	Bad
Like to teach	Don't let students do anything
Gear their expectations to the student's level of competence	Supervise too closely or not enough
Let students know what and how they think about a case	Have personality traits that interfere with the student's performance (racism, sexism, intimidation)
Provide supervision appropriate to the student's ability	Have too few or too many patients
Verify student's findings and conclusions	Don't teach how they think or how they do things
Teach "tricks of the trade"	Don't give useful feedback
Press student to be accountable for learning	Practice "poor" medicine
Give appropriate feedback-being increasingly critical as the student gains competence	

Implicit in a number of these characteristics is the notion of a continuum of clinical confidence, if not competence. Students sought reassurance and positive feedback early in their preceptorship experiences, but as they gained knowledge, experience and confidence, they sought increasing responsibility and accountability. As several pointed out, positive feedback is a motivator to continue to try, and trying/practice increases one's skill. But there was a point at which the student sought more critical evaluation of skills. The variability, or what one student called "lack of continuity", in clinical instruction created for students a considerable amount of confusion about the goals of the preceptorship program. Some concluded that the formal program failed to prepare them to perform adequately in clinical setting. Some concluded that the experiences were only to give them exposure to the clinical setting and that any concrete knowledge or skills that they gained was a bonus. Some concluded that they would have better spent their time studying for the demanding examinations of the formal courses.

In conclusion, certain generalizations about Unit II students' preceptorship experiences are supported by subjects' comments:

1. Variations in preceptorship experiences can offer students a broad view of osteopathic general practice, something most students seek.

2. Students consider for selection those preceptors who their peers have described as "being interested in teaching"; however, their actual selection preferences are based on the locale of the preceptor. Students do not know what criteria are used by the preceptorship coordinator to assign preceptors.

3. Neither selected nor assigned preceptorships necessarily coincide with a students' abilities and needs in terms of clinical competence development.

4. Clinical preceptorships vary greatly in terms of preceptors' commitment and ability to teach, what is expected or permitted of students, patient population, complexity of office organization, philosophy of medical care and patient load.

5. Preceptors are perceived as lacking understanding of both the students' individual stages of clinical competence development and their role in that process.

6. Passive students seem to learn less when they have a "bad" preceptor who does not make any demands on the student than they do when they have a "bad" preceptor who has too high expectations for student performance. Both assertive and passive students can be overwhelmed by intimidation or perceived antagonism on the part of the preceptor.

7. The co-occurrence of clinical cases in the preceptors's office with the relevant knowledge in the systems course under study is serendipitous and infrequent; hence, integration of theory and practice is inefficient.

8. Preceptors' expectations and evaluations tend to focus on the student's recall of specific information, such as drug regimens and criteria for disease, and the ability to propose the "correct" interpretation of the data presented in the case at hand.

Unit III

The focus for examining clinical competence at the Unit III level was the (then required) 48-week series of clinical rotations in ambulatory and hospital settings. The subjects of this study undertook the following clinical rotations:

6 weeks	Jr. Partnership (Private D.O. office)	
12 weeks	Internal Medicine	
6 weeks	Surgery/Anesthesiology	Base
6 weeks	Obstetrics/Gynecology	Hospital
6 weeks	Pediatrics	
6 weeks	Psychiatry	
6 weeks	Selectives	

Students could choose, depending upon availability among approximately 150 Senior Partners, and fifteen base hospitals, and virtually unlimited resources for selectives.

Subjects were asked in interviews to consider their clinical rotation experiences and to describe those which were particularly productive and unproductive in developing their clinical competence; what they were able and not able to do and what they should have been able to do; and to describe how and why they developed the clinical competence and confidence that they had at the end of Unit III. It was presumed that Unit III students would be involved in the full range of basic professional tasks, and that they would be primarily preoccupied with refining their history and physical examination skills and in developing diagnostic and management problem solving skills. Questions were, therefore, directed to those two major professional tasks, with no particular effort being made to ascertain insight into technical/procedural skill competence development.

Explanation for History and Physical Examination Competence: As was described in Chapter IV, Unit III subjects described their History and Physical Examination (H/P) skills as being thorough, accurate and efficient, although they individually described specific system evaluations to be deficient in certain respects. It was noted that the striking feature in the subjects' discussions of their H/P skills was the lack of detail. The issues of concern for Unit II students: mechanisms of the procedures, patient interaction, and understanding the meaning of the data, no longer appeared to be of concern to these students who had completed Unit III. More subjects (36%) offered no descriptions of deficiencies than offered any single descriptor. The most frequently cited deficiency (27% of the subjects) was "not efficient."

As one might expect, subjects offered little to specifically explain their competence and/or deficiency in performing the history and physical examination. The Unit III H/P is an interesting issue, particularly in light of these subjects' taciturn response to questions regarding their H/P competence. Most H/Ps were performed as part of the clerks' responsibilities for processing admitted patients--which students less than genially refer to as "scut" work. Patients on whom the clerks performed the admitting H/P might or might not have been on the service to which the student was assigned and/or might or might not have been followed by the student. All subjects described having taken hours (as many as four, but no fewer than two) to do their initial Unit III H/Ps and having literally hundreds of H/Ps assigned, but having had no demonstrations, guidance or supervision in the performance of the admitting history and physical examination. Only one subject specifically acknowledged an explanation for her H/P competence: "the house staff went over findings four or five times." The same subject explained her deficiences in performing the H/P as resulting from the fact that "MSU-COM had no physical exam course," and that she "had only done 4 or 5 H/Ps before entering Unit III," and she "never got good feedback on the H/P."

The explanations for subjects' reported confidence and competence may be explained by the sheer volume of H/Ps they report having performed.[1] That, no doubt, is a significant, though not all together satisfying, explanation. Several subjects' comments may give a clue to another important variable: increased knowledge and skills gained from sub-specialists:

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[1]One subject reported having kept a record of his admissions H/Ps and having done 350 in a five month period, none of which were reviewed with him by a clinician.

> I don't want to learn a physical exam from a general practitioner. I want to learn lymph nodes from an oncologist, how to listen to the heart from a cardiologist... to be able to do a darn good physical exam....
>
> My rotation in G.I. with _____ [specialist]... he was very organized and structured in his differentials... And to this day when I see an upper or lower G.I. bleed I have a differential in my head that is unshakeable and I have an approach that is flawless--at least in terms of my understanding--and it gets me thorough 95% of the time.
>
> Yesterday, I was working with an ophthamologist and he pointed out how I might better use the ophthalmoscope and see better in the eye--that just happens all of the time... You need repetition with guidance and occasional refined guidance to fine tune what you are doing.

Here we get a clearer view of the distinction between Unit II and Unit III history and physical examination competence. Unit III students had both the need to know and the opportunity to learn the clinical medicine knowledge essential to performing an "accurate and thorough" history and physical examination. Faced with medical problems complex and/or serious enough to require hospitalization and/or referral to specialists and subspecialists, these students realized that their previous competence was insufficient, and that their knowledge of pathology and clinical medicine was the difference between adequate and inadequate performance of the history and physical examination. Sub-specialists are seen as knowing more and, therefore, being able to do a better examination and history, and, therefore, being the best source of instruction and feedback to refine one's H/P skills. And, as was concluded from their descriptions of their H/P competence, the history and physical examination was seen by Unit III subjects as an integral part of diagnostic problem solving. Most reported that in order to both recognize and pursue important cues in the H/P, one must be very knowledgeable of disease. One gets the impression that students who are most cognizant of this relationship between "knowing and doing" are most likely to offer ambiguous descriptions of their own competence. Those students who sought advice from subspecialists described themselves as both being very competent--better even than the average professional--and needing a great deal of improvement in the H/P. The student's personal standards appear to determine whether he/she will seek competence at the "average doc" level (often described as meaning the family/G.P. D.O.) or at the specialist professional level.

Explanations for Diagnosis and Patient Management Competence: In Chapter IV, Unit III students were described as being intensely engaged in the process of learning how to diagnose and manage specific medical problems. The definition of diagnostic and patient management competence for Unit III students was vastly different from that of Unit II students, primarily because of the situational context of their learning and performance: the hospital. There are some interesting similarities and dissimilarities in the nature of the learning process and explanations for competence between the two groups.

Unit III subjects offered twenty-four (24) explanations for having attained clinical competence, as shown in Table 5.19:

Table 5.19

EXPLANATIONS FOR UNIT III CLINICAL COMPETENCE

A	Staff check findings/given immediate feedback
B	House staff tell you what you need to know
C	In-depth knowledge form specialty rotations
D	M.D. institution had good teaching
E	Staff discuss problem solving process
F	Repetition with type of case
G	Rely on Unit II didactics
H	Good teaching at base hospital
I	Used clinical reference books
J	Got to do consults
K	Given patient care responsibility
L	Took responsibility for learning
M	Didactics congruent with cases
N	Pre-MSU-COM knowledge
O	Role-modeling by staff
P	Studied patient charts
Q	Self-confidence
R	Staff had protocol for case management
S	Varied clinical experience
T	Staff interested in students
U	Students made accountable
V	Sufficient pathology
W	Peer teaching
X	Clerks organized lectures and demonstrations

(See Exhibit K for the individual subjects explanations for Unit III competence.)

Frequently cited explanations were: (K) "given patient care responsibility" (82%); (F) "repetition with type of case (64%); (H) "good teaching" (54%); (J) "got to do consults (54%); (N) "pre-MSU-COM knowledge" (54%); (A) "staff check findings/ given immediate feedback" (E) "staff discussed problem-solving process" (45%); (L) "took responsibility for learning" (36%); (Q) "Self-confidence" (36%; and (T) "Staff interested in students" (36%). The frequency with which certain explanations were offered by these Unit III subjects was unexpected given their highly variable descriptions of personal competence (Chapter IV, p. 18-20), and was in sharp contrast to the virtual idiosyncracy of Unit II subjects' explanations.

The explanations can be grouped into at least five arbitrary categories: clinical instruction (A,B,D,E,H,M,O,R,T,U); student knowledge base (C,G,N);

clinical experience/practice (F,J,K,S,V); and self-instruction/effort (I,L,P,Q,W,X). Of the commonly cited explanations, the most frequently cited explanations fall within the clinical experience category (F and K); the next most frequently cited explanations fall into the clinical instruction (H), clinical experience (J) and student knowledge (N) categories; the third most frequently cited within the clinical instruction (A,E); and the least frequently cited within the self-instruction/effort (L,Q) or clinical instruction categories.

Other insights emerge when one contrasts explanations offered by inexperienced subjects (Category I-III) with those of experienced subjects (Category IV-V), as shown in Table 5.20.

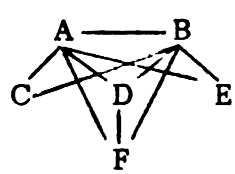
Table 5.20

COMPARISON OF EXPERIENCED AND INEXPERIENCED SUBJECTS' EXPLANATIONS FOR UNIT III COMPETENCE

	Explanation	Percent Response by Category	
		I - III (n-6)	IV - V (n-5)
A	Staff check findings/given immediate feedback	50%	40%
B	House staff tell you what you need to know	50	0
C	In-depth knowledge from specialty rotations	33	0
D	M.D. institution had good teaching	17	0
E	Staff discuss problem solving process	50	40
F	Repetition with type of case	83	40
G	Rely on Unit II didactics	33	20
H	Good teaching at base hospital	50	60
I	Used clinical reference books	17	0
J	Got to do consults	50	60
K	Given patient care responsibility	66	100
L	Took responsibility for learning	33	60
M	Didactics congruent with cases	17	40
N	Pre-MSU-COM knowledge	33	80
O	Role-modeling by staff	0	40
P	Studied Patient charts	17	0
Q	Self-confidence	17	60
R	Staff had protocol for case management	17	0
S	Varied clinical experience	0	20
T	Staff interested in students	17	60
U	Students made accountable	0	40
V	Sufficient pathology	0	20
W	Peer teaching	0	40
X	Clerks organized lectures and demonstrations	0	20

These data suggest that students, regardless of prior medical experience, attributed their competence to their MSU-COM didactic base, feedback on performance, good teaching, including the staff discussing their problem solving process, and opportunities to perform somewhat independently (doing consults). Inexperienced students gave more credit for their competence to being provided specific directions, protocols and instruction, repetition of specific tasks, and study of clinical references. Experienced students, on the other hand, were more likely to credit having been given or having taken responsibility and accountability of patient care, their prior knowledge and resulting self-confidence, varied experience and case pathology, role modeling by staff, didactics being congruent with the cases they were currently working up, self-instructional efforts, and recognition by the clinicians. In sum, experienced students appeared more pragmatic and self-assertive in the clinical learning, whereas, inexperienced students appeared to require more formal teaching/guidance.

When one examines the contingency data, several interesting patterns of associations emerge. Table 5.21 reveals the probabilities of paired (associated) explanations for Category I-III (inexperienced) subjects. (See Exhibit T for associations of all Unit III subjects.) Several obvious patterns are seen. In the first, the cluster of clinical instruction-related explanations (A,B,C,D,E) are associated with a single clinical experience explanation (F), where:



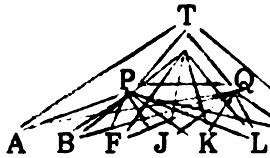
(1)

This may suggest that inexperienced students perceive the efficacy of "repetition with type of case" in developing clinical competence to be contingent on clinical instruction. A second pattern of associated explanations, where:

Table 5.21

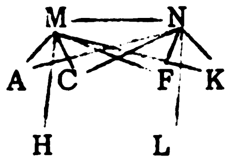
EXPLANATIONS FOR UNIT III COMPETENCE OFFERED BY CATEGORY I-III SUBJECTS

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
A	-	.25	.17	.09	.25	.42	.14	.25	.09	.25	.33	.17	.09	.17	0	.09	.09	.09	0	.09	0	0	0	0
B	.33	-	.17	.09	.25	.42	.17	.25	.09	.25	.33	.17	.09	.17	0	.09	.09	.09	0	.09	0	0	0	0
C	.33	.17	-	.06	.17	.27	.11	.17	.06	.17	.22	.11	.06	.11	0	.06	.06	.06	0	.06	0	0	0	0
D	.17	.17	.17	-	.09	.14	.06	.09	.03	.09	.11	.06	.03	.06	0	.03	.03	.03	0	.03	0	0	0	0
E	.33	.33	.17	.17	-	.42	.17	.25	.09	.25	.33	.17	.09	.17	0	.09	.09	.09	0	.09	0	0	0	0
F	.50	.50	.33	.17	.33	-	.27	.42	.14	.42	.55	.27	.14	.27	0	.14	.14	.14	0	.14	0	0	0	0
G	0	.17	0	0	0	.33	-	.17	.06	.17	.22	.11	.06	.11	0	.06	.06	.06	0	.06	0	0	0	0
H	.17	0	.17	0	.17	.33	.17	-	.09	.25	.33	.17	.09	.17	0	.09	.09	.09	0	.09	0	0	0	0
I	0	0	0	0	0	.17	.17	.17	-	.09	.11	.06	.03	.06	0	.03	.03	.03	0	.03	0	0	0	0
J	.17	.33	0	0	.17	.33	.17	.17	0	-	.33	.17	.09	.17	0	.09	.09	.09	0	.09	0	0	0	0
K	.33	.33	.17	0	.17	.50	.17	.33	0	.50	-	.22	.11	.22	0	.11	.11	.11	0	.11	0	0	0	0
L	.17	.33	0	0	0	.33	.17	0	0	.33	.33	-	.06	.11	0	.06	.06	.06	0	.06	0	0	0	0
M	.17	0	.17	0	0	.17	0	.17	0	0	.17	0	-	.06	0	.03	.03	.03	0	.03	0	0	0	0
N	.33	.17	.17	0	0	.33	0	.17	0	.17	.33	.17	.17	-	0	.06	.06	.06	0	.06	0	0	0	0
O	0	0	0	0	0	0	0	0	0	0	0	0	0	0 -	0	0	0	0	0	0	0	0	0	0
P	.17	.17	0	0	0	.17	0	0	0	.17	.17	.17	0	.17	0	-	.03	.03	0	.03	0	0	0	0
Q	.17	.17	0	0	0	.17	0	0	0	.17	.17	.17	0	.17	0	.17	-	.03	0	.03	0	0	0	0
R	0	0	0	0	.17	0	0	0	0	0	.17	0	0	0	0	0	0	-	0	.03	0	0	0	0
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	.03	0	0	0	0
T	.17	.17	0	0	0	.17	0	0	0	.17	.17	.17	0	.17	0	.17	.17	0	0	-	0	0	0	0
U	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0
V	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0
X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-



(2) ,

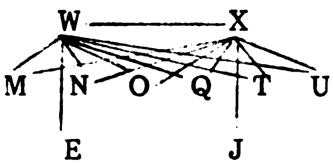
suggests that they also viewed the efficacy of clinical instruction (A,B), clinical experience (F,J,K) and self-instruction/effort (L,N) as being associated with affective aspects of the conditions of learning ("staff is interested in students" and "self-confidence") and student initiative ("study patient charts"). A third pattern:



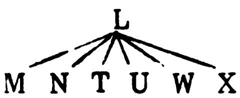
(3)

suggests that those students without medically-related experience who brought to their clinical training some health-related experience/knowledge associated competence development with receiving didactic material that was congruent with the clinical cases with which they were currently working. Under these conditions, clinical instruction (A,C,H) and clinical experience (F,K,L) were productive in developing clinical competence.

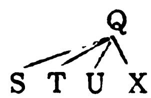
When one examines the associated explanations of experienced students, different patterns emerge, as revealed in Table 5.22. The first cluster of contingencies described for the inexperienced student does not emerge at all, and in the second and third clusters different patterns emerge. For example, self-instructional explanations, particularly W,X,L, and Q, were significantly correlated with other explanations:



(1) ,



(2) , and



(3).

Table 5.22

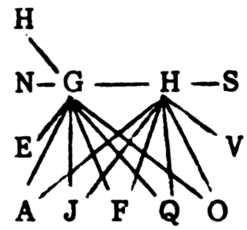
EXPLANATIONS FOR UNIT III COMPETENCE OFFERED BY CATEGORY IV - V SUBJECTS

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
A	-	0	0	0	.16	.16	0	.24	0	.24	.40	.16	.16	.32	.16	0	.24	0	.08	.24	.16	.08	.16	.08
B	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	.20	0	0	0	-	.16	0	.24	0	.24	.40	.16	.16	.32	.16	0	.24	0	.08	.24	.16	.08	.16	.08
F	.40	0	0	0	.20	-	0	.24	0	.24	.40	.16	.16	.32	.16	0	.24	0	.08	.24	.16	.08	.16	.08
G	.20	0	0	0	.20	.20	-	.12	0	.12	.20	.08	.08	.16	.08	0	.12	0	.04	.12	.08	.04	.08	.04
H	.40	0	0	0	.20	.40	.20	-	0	.36	.60	.24	.24	.48	.24	0	.36	0	.12	.36	.24	.12	.24	.12
I	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
J	.20	0	0	0	.20	.20	.20	.40	0	-	.60	.24	.24	.48	.24	0	.36	0	.12	.36	.24	.12	.24	.12
K	.40	0	0	0	.40	.40	.20	.60	0	.60	-	.40	.40	.80	.40	0	.60	0	.20	.60	.40	.20	.40	.20
L	0	0	0	0	.20	0	0	0	0	.20	.40	-	.16	.32	.16	0	.24	0	.08	.24	.16	.08	.16	.08
M	0	0	0	0	.20	0	0	0	0	.20	.40	.40	-	.32	.16	0	.24	0	.08	.24	.16	.08	.16	.08
N	.20	0	0	0	.40	.20	.20	.40	0	.60	.80	.40	.40	-	.32	0	.48	0	.16	.148	.32	.16	.32	.16
O	.40	0	0	0	.20	.40	.20	.40	0	.20	.40	0	0	.20	-	0	.24	0	.08	.24	.16	.08	.16	.08
P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0
Q	.20	0	0	0	.20	.20	.20	.40	0	.60	.60	.20	.20	.60	.20	0	-	0	.12	.36	.24	.12	.24	.12
R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0	0	0
S	0	0	0	0	0	0	0	.20	0	.20	.20	0	0	.20	0	0	.20	0	-	.12	.08	.04	.08	.04
T	0	0	0	0	.20	0	0	.20	0	.40	.60	.40	.40	.60	0	0	.40	0	.20	-	.24	.12	.24	.12
U	0	0	0	0	0	0	0	.20	0	.40	.40	.20	.20	.40	0	0	.40	0	.20	.400	-	.08	.16	.08
V	.20	0	0	0	0	.20	0	.20	0	0	.20	0	0	0	.20	0	0	0	0	0	0	-	.08	.04
W	0	0	0	0	.20	0	0	0	0	.20	.40	.40	.40	.40	0	0	.20	0	0	.40	.20	0	-	.08
X	0	0	0	0	0	0	0	0	0	.20	.20	.20	.20	.20	0	0	.20	0	0	.20	.20	0	.20	-

These associations suggest that experienced students assumed more responsibility--or credit--than inexperienced students for their effective use of learning opportunities to develop their clinical competence.

Other association clusters also distinguished experienced students:

(4), and



(5).

These various associations suggest that the experienced student did not place upon clinical instructors an expectation for didactic instruction--or what several subjects referred to as an "academic approach"--so much as expecting them to recognize the student's ability and to allow him/her to assume corresponding responsibility in caring for the patient. This is consistent with the previous interpretation that experienced subjects were more pragmatic in their approach to learning--an interpretation also posed for experienced students in Unit II.

Unit III subjects posed twenty-three (23) explanations for their deficiencies in diagnosis and patient care management, with some obvious differences between explanations of inexperienced and experienced subjects, as shown in Table 5.23.

Table 5.23

COMPARISON OF EXPERIENCED AND INEXPERIENCED SUBJECTS' EXPLANATIONS FOR UNIT III DEFICIENCES IN DIAGNOSTIC AND MANAGEMENT COMPETENCE

	Explanation	Percent Response by Category I - III	IV - V
A	No differential diagnosis course (MSU-COM)	33%	20%
B	Exam process (MSU-COM) doesn't require that you think	16	0
C	No orientation to hospital, procedures, goals	16	0
D	Not allowed to do certain things as a clerk/not challenged	33	60
E	If I don't see it, I don't understand it	16	0
F	Lectures not congruent with service on	50	0
G	No personal interest	16	40
H	Differences in approach by clinicians/ no quality control	33	0
I	No emphasis on self-teaching/reading at MSU-COM	16	0
J	Teaching at too high level for clerk	50	20
K	Insufficient patient base	33	20
L	Not good role models	16	0
M	No reinforcement	33	0
N	No feedback	16	0
O	Too much scut work	33	0
P	Lack of clnical relevance in basic science courses (MSU-COM)	16	0
Q	Rotation at wrong time	16	20
R	Clerk's academic perspective not realistic in clinical learning	16	0
S	lack of educational orientation of hospital/ no teaching	33	80
T	No patient responsibility	0	60
U	Curriculum deficient in topic(s)	0	60
V	House staff not helpful	16	20
W	No sub-specialty rotation	0	20

Similar to Unit II subjects' explanations of deficiencies, these Unit III subjects more frequently cited explanations related to faculty program design (A,B,C,D,I,O,P,Q,S,T,U,W) than those related to clinical instruction (D,H,J,K,L,M,N) or personal behavior (E,G,R). Both experienced and inexperienced students were more likely to fault the program; however, inexperienced subjects offered three times as many explanations related to clinical instruction as did experienced subjects. Again it appears that inexperienced students harbor greater and more specific expectations of the program and clinical instructors. They appear to have expected that the clinical training program be "academic," whereas, experienced students expected some basic, pragmatic instruction in conjunction with experience, and responsibility commensurate with their abilities. Explanations for personal deficiencies might be seen as expressions of unmet personal expectations.

When the correlations of paired explanations are examined, the difference between experienced and inexperienced subjects is further magnified. The contingencies matrix for inexperienced subjects, Table 5.24, can be interpreted as describing individual subjects' associations, with little common ground for all subjects. Explanations (F), "lectures not congruent with service on" and (J), "teaching at too high level for clerk," are the only ones cited by at least half of the subjects, but each of them is associated with an idiosyncratic cluster of explanations and not with each other. That is, both (F) and (J) are common elements in nearly all subjects' sets of explanations, but contingent explanations were unique to the individual. This finding is consistent with previous findings of inexperienced students at other levels of training. Inexperienced students' learning appears to be a more privatized process, with each student arriving at different ends by different means.

In contrast, Table 5.25 shows a much more homogeneous set of correlations of the explanations offered by experienced subjects. Experienced subjects used fewer, more common explanations. Explanations (S) "lack of educational orientation of hospital/no teaching," (T) "no patient responsibility," and (U) "curriculum deficient in topics" appear as central to all other significantly correlated explanations:

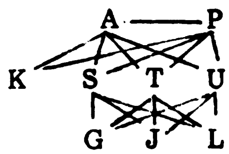
Table 5.24

ASSOCIATIONS OF EXPLANATIONS FOR UNIT III DEFICIENCIES
IN DIAGNOSTIC AND MANAGEMENT COMPETENCE
OFFERED BY CATEGORY I - III UNIT III SUBJECTS

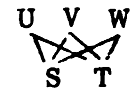
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
A	-	.05	.05	.11	.05	.165	.05	.11	.05	.165	.11	.05	.11	.05	.05	.05	.05	.05	.11	0	0	.05	0
B	.166	-	.027	.05	.027	.083	.027	.05	.027	.083	.05	.027	.05	.027	.027	.027	.027	.027	.05	0	0	.027	0
C	.166	.166	-	.05	.027	.083	.027	.05	.027	.083	.05	.027	.05	.028	.027	.027	.027	.027	.05	0	0	.027	0
D	.166	.166	.165	-	.05	.016	.05	.11	.05	.165	.11	.05	.11	.05	.05	.05	.05	.05	.11	0	0	.05	0
E	.165	.165	.165	.165	-	.083	.027	.05	.027	.083	.05	.027	.05	.027	.027	.027	.027	.027	.05	0	0	.027	0
F	.165	.165	.165	.333	.165	-	.083	.165	.083	.25	.165	.083	.165	.083	.083	.083	.083	.083	.162	0	0	.083	0
G	.165	.165	.165	.165	.165	.165	-	.05	.027	.083	.05	.027	.05	.027	.027	.027	.027	.027	.05	0	0	.027	0
H	0	0	0	0	0	.165	0	-	.05	.165	.11	.05	.11	.05	.05	.05	.05	.05	.11	0	0	.05	0
I	0	0	0	0	0	0	0	.166	-	.083	.05	.027	.05	.027	.027	.027	.027	.027	.05	0	0	.027	0
J	.165	0	0	.165	0	.165	0	.166	.166	-	.167	.083	.167	.083	.083	.083	.083	.083	.167	0	0	.083	0
K	0	0	0	0	0	.165	0	.166	0	0	-	.05	.11	.05	.05	.05	.05	.05	.11	0	0	.05	0
L	0	0	0	0	0	.165	0	.166	0	0	.166	-	.05	.027	.027	.027	.027	.027	.05	0	0	.027	0
M	0	0	0	.165	0	.333	0	.166	0	.166	.166	.166	-	.05	.05	.05	.05	.05	.11	0	0	.05	0
N	0	0	0	0	0	.166	0	.166	0	0	.166	.166	.166	-	.027	.027	.027	.027	.05	0	0	.027	0
O	0	0	0	0	0	.166	0	.166	0	0	.166	.166	.166	.166	-	.027	.027	.027	.05	0	0	.027	0
P	0	0	0	0	0	.166	0	.166	0	0	.166	.166	.166	.166	.166	-	.027	.027	.05	0	0	.027	0
Q	0	0	0	0	0	.166	0	.166	0	0	.166	.166	.166	.166	.166	.166	-	.027	.05	0	0	.027	0
R	.166	0	0	0	0	0	0	0	0	.166	0	0	0	0	0	0	0	-	.05	0	0	.027	0
S	.166	0	0	.166	0	.166	0	0	0	.333	0	0	.166	0	0	0	0	.166	-	0	0	.50	0
T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0
U	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0
V	0	0	0	.166	.0	.166	0	0	0	.166	0	0	.166	0	0	0	0	0	.166	0	0	-	0
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-

PLEASE NOTE:

Page 196 is not missing, it is misnumbered.



and



These data appear consistent with previous interpretations that experienced students did not hold many expectations of clinical instructors, except to allow students patient care responsibility. The fundamentals of medicine were assumed to have been taught on campus in previous Units.

The analyses of the interviews with Unit III subjects regarding the explanations for their clinical competence support the following generalizations:

1. The situational context of clinical experience is an important variable in the development of clinical competence. Hospitals generally offer students experience with more serious medical problems and more sophisticated diagnostic and therapeutic resources than do ambulatory care facilities.

2. The amount of clinical experience the student has affects the amount of confidence and competence he/she has in managing his/her own clinical training and the expectations he/she has for clinical instruction.

3. The Unit III history and physical examination competence is extended well beyond that of Unit II because of the student's increased knowledge of and experience with serious medical problems and instruction by sub-specialists.

4. Inexperienced students, more than those who have extensive medically-related training and experience, associate their clinical competence development with structured clinical training; i.e. guided learning around clinical cases.

5. Experienced students, more than inexperienced individuals, associate their clinical competence development with being given and held accountable for responsibility in patient care.

6. Although the inexperienced are more dependent upon structured clinical teaching, both experienced and inexperienced students hold the formal program (Units I and II) accountable for their clinical skill deficiencies.

Further insight into these generalizations can be gained from students' perceptions of their preparation for Unit III and the nature of their clinical rotations.

The adequacy of preparation for Unit III: Students' perceptions of the adequacy of their preparation for Unit III within the formal (Units I and II) program provided further insight into the explanations for Unit III deficiencies. Table 5.26 lists the twenty-two (22) areas in which these subjects perceived themselves to be insufficiently prepared for Unit III.

Table 5.26

AREAS OF PERCEIVED INSUFFICIENT PREPARATION FOR UNIT III

	Deficiency Percent Response by Category	I - III (n=6)	IV - V (n=5)
A	Physical exam emphasis	16%	40%
B	Differential diagnosis course	16	60
C	Journal/reference reading	33	20
D	Specific clinical pharmacology	16	20
E	Pathology (to distinguish normal from abnormal)	33	20
F	Pelvic examinations	16	20
G	Reinforcement of EKG interpretation	16	0
H	Reinforcement of X-ray film interpretation	16	20
I	Pulmonary tests	16	20
J	Blood gases/electrolyte management	16	40
K	Facility in suturing	16	0
L	Respiratory system biology	16	0
M	Obstetrics system biology	16	20
N	Orthopedics system biology	16	20
O	Ophthamology	16	0
P	Thrust manipulative skills	0	20
Q	Laboratory medicine	0	40
R	Medical terminology	0	20
S	OMT skills emphasis	0	20
T	Common clinical medicine	0	20
U	Admitting orders	0	20
V	Practical nursing treatments	0	20

As this data reveals, the perceived inadequacies of the formal program are quite idiosyncratic, particularly within the inexperienced group, and there are differences between experienced and inexperienced subjects' perceptions. More important, however, is what this list implies regarding student expectations: the formal program should provide students with knowledge and skills clinical instructors demand of students. That is, Unit III is not seen as an extension of a continuous instructional process of the College and clinical instructors do not necessarily have responsibility for building on what the individual student brings to the clinical training setting. Instead, the formal program is presumed responsible for preparing the student to undertake whatever demands the clinical training program makes of him/her. Thus, since they have foreknowledge of the medical care process, organization and function of the medical care system, and some technical and adaptive skills, medically-experienced students were less vulnerable to and more "realistic" about the nature of clinical training. Thus also, experienced students placed different demands on the formal program--in part because they possessed certain knowledge that inexperienced students might not have had, but also because they had different expectations of the clinical training programs. They also appear to have had more self-confidence and skills in managing their own learning.

Subjects' discussions of their preparation for the Unit III clinical externship support the following generalizations:

1. The teaching/learning process of Units I and II does not prepare students for the process used in the clinical setting.

2. The systems courses are an effective way to learn the basics of medical <u>science</u>.

3. Some systems courses are perceived as better than others in that they:

    - emphasize knowledge and skills routinely used in clinical medicine
    - provide a framework for developing a differential diagnosis for problems of the system
    - test important, clinical relevant knowledge and skills

4. Systems courses are faulted for not preparing students with all of the clinical medicine they need to know for their extern/internships.

5. Students do not functionally retain all of the information given them in the systems biology courses for a variety of reasons, most commonly:

   . information wasn't reinforced by clinical experience
   . students "learn" information for test purposes, not for practical application
   . students with extensive pre-medical school general practice experience discount significant "esoteric" information

6. Students, with the possible exception of those with medically-related clinical experience, feel insufficiently prepared in physical examination skills, differential diagnosis/problem solving, and journal article interpretation to function effectively as a clinical student.

7. Perceived insufficiencies in preparation for Unit III reflect differences in demands of clinical supervisors, students' standards of performance, pre-Unit III clinical competence, students' insight and professional goals.

Students' perceptions of their clinical rotation experiences and why they did and did not productively contribute to their clinical competence development further explain these interpretations.

The productivity of clinical rotations: Unit III subjects were asked to identify and describe clinical rotations which they considered the most and least productive in terms of their clinical competence development, as a means of gaining more insight into the conditions of learning. (See Exhibit L for all subjects' descriptions of these rotations.)

Table 5.27 shows that, in general, no particular pattern emerged for perception of any rotation as most or least productive. With the exception of the psychiatry rotation, subjects provided no evidence that the site of the rotation was a significant factor in determining the perception of productivity. In the instance of psychiatry, all those who reported it as the least productive rotation had been

assigned to the same facility, whereas those reporting it to be the most productive and been assigned elsewhere. In several instances, subjects trained at the same base hospital reported the productivity of a given rotation differently.

Table 5.27

LEAST AND MOST PRODUCTIVE UNIT III CLINICAL ROTATIONS

Rotation	Percent Response as Most	Percent Response as Least
Jr. Partnership	9%	18%
Medicine	18	27
Infectious Disease	9	-
G.I.	27	-
Psychiatry	18	27
Pulmonary Medicine	18	-
OB/Gyn	27	9
Hematology	-	9
Nephrology	-	9
Pediatrics	-	9
Surgery	9	18
Radiology	-	9
Emergency Room	9	-
All good/none bad	9	9

When one contrasts the descriptors of a most productive rotation with those for a least productive rotation, further understanding of the process of competence development can be gained. Tables 5.28 and 5.29 present those respective sets of descriptors.

Table 5.28

EXPLANATIONS FOR A UNIT III CLINICAL ROTATION
BEING VERY SUPPORTIVE OF CLINICAL COMPETENCE DEVELOPMENT

		I (n=2)	II (n=4)	III (n=0)	IV (n=3)	V (n=2)	All
A	Student's cumulative knowledge	50	25	-	0	50	27
B	Got to manage patients/make decisions	50	25	-	100	100	64
C	Made accountable for diagnostic knowledge	50	0	-	33	0	18
D	Academic	0	50	-	33	0	27
E	Lectures immediate followed by relevant case write-up	0	25	-	0	0	9
F	Lots of hands on experience	0	50	-	0	50	36
G	Staff helpful	0	25	-	0	50	18
H	Lots of feedback	0	25	-	66	100	27
I	Taught structured differentials	0	25	-	0	50	18
J	Taught to do procedures	0	25	-	33	50	27
K	Personal interest	0	0	-	33	50	18
L	Taught to be efficient	0	0	-	0	50	9
M	Felt competent	0	25	-	0	50	18

Table 5.29

EXPLANATIONS FOR A UNIT III CLINICAL ROTATION
BEING UNSUPPORTIVE OF CLINICAL COMPETENCE DEVELOPMENT

		I (n=2)	II (n=4)	III (n=0)	IV (n=3)	V (n=2)	All
A	Personally not prepared for Unit III	50	0	-	0	0	9
B	Instruction above extern level	50	0	-	0	0	9
C	Too many students on service	0	50	-	33	0	27
D	First rotation	0	25	-	0	0	9
E	No teaching on service	0	50	-	100	50	64
F	No patient care responsibility assigned	0	50	-	100	50	64
G	Difference in G.P./hospital philosophy	0	0	-	33	0	9
H	Assigned to "bad" intern	0	0	-	33	0	9
I	High service demand stuff	0	0	-	33	0	9
J	No house staff	0	0	-	0	50	9
K	Little pathology	0	0	-	0	50	9

Unit III subjects, irrespective of pre-medical experience shared opinions of what helped them develop clinical competence: their having sufficient cumulative knowledge to benefit from the rotation; having hands-on experience with patient care responsibility; being taught to do and being evaluated on clinical procedures and problem solving; having some degree of self-confidence with which to perform and take advantage of the learning opportunities. Table 5.30 reaffirms the centrality of these criteria. The five general descriptors account for most of the explanations for productivity in all rotations except surgery--which was explained as "was taught to be efficient with time." Conversely, when externs were not actively involved in the patient care process or clinicians did not (or could not) teach the clinical skills, students perceived themselves as being unable to optimally develop clinical competence, as shown in Table 5.31.

Table 5.30

RELATIONSHIP OF CRITERIA FOR PRODUCTIVE
CLINICAL ROTATION TO SPECIFIC UNIT in ROTATION

Percent of Explanations Offered

	Other	Cummulative Knowledge	Hands-on Experience/ Pt. Care Resp.	Taught Clinical Skills	Evaluated on Clinical Skills	Self-Confidence
Jr. Partnership	0	-	100%	-	-	-
Medicine	30	20	20	10	20	-
Infectious Disease	0	5	50	-	-	
G.I.	0	10	20	40	20	10
Psychiatry	0	-	25	25	50	-
Pulmonary Medicine	0	-	33	66	-	-
OB/Gyn	25	-	75	-	-	-
Surgery	100	-	-	-	-	-
ER	33	-	33	-	33	

Table 5.31

RELATIONSHIP OF CRITERIA FOR UNPRODUCTIVE CLINICAL ROTATION TO SPECIFIC UNIT III ROTATION

	Percent of Explanations Offered			
	Too many students	No Teaching on Service	No Patient Care Resp.	Other
Jr. Partnership	-	-	50%	50%
Medicine	-	100%	-	0
Psychiatry	-	-	100	0
OB/Gyn	-	-	100	0
Hematology	-	-	-	
Nephrology	50	-	50	0
Pediatrics	100	-	-	0
Surgery	-	100	-	0
Radiology		100		0

Several insights can be gained from these data. First, placement of clinical rotation within the student's overall clinical schedule is likely a significant factor in how the student performs, and how much and what he/she gains from the learning opportunities available. That is, a student taking an internal medicine rotation as the first Unit III rotation will gain different (less) advanced skills and knowledge than would he/she taking the same rotation at the end of Unit III. On the other hand, having had such a rotation, he/she will likely be more confident and competent to undertake another rotation, for instance the Junior Partnership. Unfortunately, the available data does not allow for a more objective analysis of students' change in perceptions as they gain more clinical experience and knowledge. It is suspected that there is a highly complex relationship between time, accumulated knowledge and experience, clinical instruction and performance. Another interpretation is that it is probably not accurate to presume from some students' experience in a given rotation what other students' experience will be. Students did report that early rotations, irrespective of discipline, primarily served to orient them to the clinical student roles and clinical settings. Much of the student's energy was expended in basic orientation--learning the "who, what, where and how" of the clinical setting he/she was in. And, although subjects described themselves as having to re-orient to each new rotation, the major role adjustments were probably made in the first several rotations. Externs reported having selected for internship (or vice versa) their base hospital precisely in order to avoid having to spend time figuring out the social dynamics of a new hospital.

Second, neither exclusively didactic rotations nor primarily practice rotations were perceived by students as being productive in terms of clinical competence development. For example, even though three subjects commended one psychiatric rotation for its excellent lecture series, they were unanimous in their conclusion that it was the least productive of their rotations. They called it "a waste of time," reportedly because they saw few patients and seldom, if ever, worked-up the patients or followed their cases. In contrast were the equally maligned surgery rotations, in which students spent long hours as ancillary surgical assistants without instruction on the surgical procedure underway, work-up and follow through of selected patients, or didactic presentations or assignments. Students placed in the exclusive role of "retractor technicians" found little to describe as a learning outcome (except negative attitudes towards surgery and surgeons.)

The clinical rotations credited with developing clinical competence were those that had both a teaching and practice component, provided the practice involved holding the student accountable for his/her problem solving. Even if they were participants in the patients' care, followed patients throughout hospitalization, and learned to do specific technical procedures, students reported being uncertain of their ability to work-up and manage a particular type of medical problem if they did not have to interpret data, propose problem lists and/or management strategies, and see the consequences of their decisions. Again, it must be stressed that Unit III subjects were, in fact, interns at the time of interview, and as such were assessing past experiences in light of new levels of professional responsibility. It is very likely, if we can extrapolate from our data on Units I and II retrospections, that their perceptions would have been different if they had been interviewed at the end of Unit III.

In summary, interviews with Unit III subjects support certain generalizations about the clinical externship experiences:

1. Clinical rotations vary greatly in terms of clinical supervisors' (house staff and attendings) commitment and ability to teach, what is expected or permitted of students, patient populations (pathology, number) and didactic content.

2. Students consider for selection those rotations and base hospitals which peers have commended and are thought to support their anticipated professional goals. Their selections are most likely to be dictated by locale. Students do not, until after the fact, have insight into how to plan the choice or sequence of rotations to maximaze their development of clinical competence.

3. The co-occurence of clinical cases in the assigned rotation and any lectures presented through the DME office is serendipitous.

4. Clinical supervisors, with some exceptions, are perceived as lacking both understanding of students' individual stages of clinical competence development and personal commitment to students' professional development.

5. Most teaching of externs is done by house staff, with attendings being primarily concerned with patient care and training of residents.

6. The amount of externs' hands-on experience and the quality of clinical teaching most frequently is predicated on the skill and knowledge level of the supervising intern--the least competent person in the house staff hierarchy but the most empathetic to the extern's learning needs.

7. Structured approaches to problem solving are most frequently provided by sub-specialty internists.

8. Instruction is geared to diagnosis and management; little or no instruction and evaluation is directed to medical history and physical examination skills.

9. Externs perceive themselves to be students (as opposed to interns who tend to perceive themselves to be health care providers primarily and students secondarily) whose objective is accuracy, not speed or efficiency, even though the pace of clinical instruction is most often geared to resident or attending level of efficiency.

10. Externs do not necessarily get opportunities for hands-on experience of sufficient quality or quantity to become competent to undertake the professional responsibilities thay will acquire as interns.

11. Effective utilization of a clinical rotation to develop professional competence is dependent on its proper scheduling vis a vis the student's preparation for that rotation.

12. Post-facto insights into what one should haye become competent in during Unit III and how one might have managed that, did not necessarily guide the student's learning process and goals.

13. Students have generally agreed upon criteria for "productive" and "unproductive" clinical rotations:

Productive

- There is a didactic component
- One-on-one learning with supervisor
- Held accountable for knowledge/skills
- Immediate feedback provided
- Assigned patients for H/P and continued follow-up
- Didactic continuous with clinical experience
- Supervisors provide models for medical problem solving
- Given appropriate, increasing patient care responsibility
- Service has sufficient patients with pathology
- Clinical supervisor interested in teaching
- Supervisors emphasize basic, frequently encountered problems
- Positive re-inforcement is provided
- There is opportunity for repetitive practice

Unproductive

- Either didactic or experiential learning opportunity provided --not both
- Not held accountable for knowledge/skills
- Little or not feedback provided
- No patient care role defined
- Little or no opportunity to follow-up specific patients
- Lack of hands-on experience
- No hand-on-hands skills teaching
- Inappropriate scheduling or rotation re: stage of development
- Too many students on rotation
- Too few patients or pathology
- No house staff on service or not available to teach
- Student inadequately prepared
- Clincal supervisor uninterested in teaching
- Didactic geared too high for extern
- Emphasis placed on "zebra" cases

Further insight into the process by which osteopathic medical students develop clinical competence is revealed in their discussions of the relationship of theory and clinical practice, presented in the next section.

Integration of Theory and Practice

The practice of osteopathic medicine primarily involves creatively applying scientific theory to resolve health and illness related problems. There are, of course specific manual skills in which the competent physician must be proficient: auscultating, percussing, palpating, endoscoping, suturing, intubating, manipulating, etc. But a physician is not simply a technician. He/she is expected to understand the principles of anatomy, physiology, biochemistry, physics, pathology, etc. underlying each procedure performed. He/she is expected to know the processes of health and disease which inform current medical problem solving. He/she is expected to understand the scientific bases of therapeutic approaches to problem management. And he/she is expected to understand the principles of social interaction and individual behavior, and to use them creatively in applying technical skills and medical knowledge to aid the individual who has sought professional counsel. Educational programs designed to produce competent osteopathic physicians must, then, ensure that students are more than technicians; that they have developed technical and problem solving skills grounded in the available theoretical knowledge.

The osteopathic medical education program under study presents basic scientific theory in the biological, behavioral and medical sciences through an intensive series of requisite courses across the first two years (Unit I and II) of the curriculum. Laboratory courses are also taught throughout the first two years, which include history and physical examination skills, manipulative therapy, and technical procedures such as casting and suturing, as well as diagnostic laboratory procedures such as setting up bacteriologic cultures and interpreting blood smears. In an effort to enhance students' understanding of the application of theory to the practice of osteopathic medicine, clinical experiences are provided in each of the first two years as well. The third, and final, phase of the program (Unit III) is conducted exclusively within clinical settings, and providing students opportunities to learn advanced procedureal skills and knowledge of clinical medicine, and to refine and extend their medical problem solving competence. (See Chapter 3, page 72 for a diagram of the curriculum model.)

Implicit in the design of the curriculum is the assumption that students, at each stage of the educational program, are integrating theory and practice. It is assumed, for example, that Unit I students bring to the physical examination laboratory the knowledge they are concurrently learning in anatomy, and apply it when learning specific examination procedures. It is similarly assumed that Unit II students carry to their preceptorship experiences, their cumulative knowledge and skills, including that gained in the systems biology courses.

Extensive observations of students in the physical examination laboratory and discussions with students at all levels of the program suggested that.the integration of theory and practice is not so automatic and continuous as the curriculum design implies or faculty seem to assume. Further it seemed that the process by which the osteopathic medical student integrates theory and practice is a critical element in his/her development of clincal competence therefore, requiring more understanding than currently exists.

For this study, medical problem solving (diagnosis and patient management) served as the focus for gaining insight into what effect theory has on performance and, conversely, how practice can influence the understanding of theory. Unit II students were selected as the subject for this investigation for several reasons: (1)

in contrast to Unit I students, they were continuously involved in clinical experiences throughout the duration of their Unit studies; (2) in contrast to Unit III students, they were continuously involved in structured, didactic instruction in theory; and (3) the Unit II clinical experiences were planned so as to enhance the integration of theory and practice.

Unit II subjects had been enrolled in a series of systems biology courses during the previous four terms, one or two courses per term, and, concurrently, in a series of preceptorship experiences in private physicians' offices, public agencies and/or the University ambulatory care clinic (one 40-hour experience per term). Preceptorship experiences were guided by a course syllabus in which were outlined specific performance objectives. These objectives focused on certain office business and professional procedures, the history and physical examination, and on working-up and managing specific medical problems for each of the body systems studied to the time of that particular preceptorship. That is, the preceptorship objectives were cumulative, and paralleled the didactic program. To further facilitate students' integration of theory and practice, faculty assigned to students the writing of a complete H/P, problem list, and management plan for each of several of the specific medical problems outlined in the syllabus, preferring to use an actual cases they had worked on in the preceptors' office.

As earlier described in this chapter, students' clinical experiences in the preceptorships were actually very different. Preceptorship experiences varied in many ways: the types of patient problems confronted; the pace of the practice; what the physician expected of the student; and the amount of guidance and feedback given the student. In some offices students might exclusively work with pre-natal care patients or with somatic dysfunction problems involving manipulative therapy; in others they might see varied and complex medical problems. And, as described in Chapter IV, students' competence also varied greatly.

In sum, the actual learning experiences did not match what curriculum planners had intended, and thus, the program could not facilitate the integration of theory and practice as had been intended. Nonetheless, each student, when faced with a patient in the clinical situation or a theoretical problem in the classroom, confronted a challenge to integrate theory and practice. It was those personal, immediate situations which served as the focus for the in-depth interviews of this study.

The Affect of Practice Preceding Theory

In discussing their earliest experiences in preceptors' offices, most Unit II students described themselves as feeling vulnerable, slow and awkward. Similar descriptors would sometimes be used when describing themselves in later experiences, although generally there was an impression of increasing confidence in the description of each succeeding preceptorship. When students were asked to describe their medical problem solving competence, they invariably responded, "it depends." It turned out to depend on whether they had seen a similar problem before or and/whether they had had the systems course for the system(s) involved in the patients' chief complaint. When they had had neither, their performance descriptions were "slow" and "inefficient." Retention of theoretical knowledge, also "depended" on whether they had worked with a relevant case. (See Exhibit L for students' descriptions of the affect of knowledge and experience on professional competence.)

The affect on performance: Unit II students generally wanted to at least look like able learners, if not able performers, in their preceptorship experiences. Being able to carry out their clinical assignments without embarassing themselves or the physician was of utmost importance to these students. However, when they confronted a clinical problem with which they had no previous experience or for which they had no theoretical background, they were inefficient and felt extremely vulnerable.

As Table 5.32 reveals, when students confronted medical problems for the first time without a theory base, they were reduced to their lowest level of medical problem solving competence.

Table 5.32

MEDICAL PROBLEM SOLVING COMPETENCE
WHEN PRACTICE PRECEDES THEORY

	Descriptor	Percent Response
A	Have to ask physician	45%
B	Can't talk clinical language	9
C	Embarassed/uncomfortable	36
D	Don't know what anything means	45
E	Fearful/anxious	18
F	Follow H/P protocol	9
G	Don't understand explanations	9
H	Have to look everything up	9
I	Slow	9
J	Don't know efficient sources	9
K	Had prior experience/no problems	9

More than half of the subjects in emotion-laden terms described experiencing considerable discomfort at having to approach a problem for which they had neither a practical nor a theoretical background.

> I was very embarrassed. I was sent in to a fat woman; she has pain in her leg; first metatarsal swollen; pain at night; it hurts terribly. He [physician] says, "What is it?!" I says, "I haven't the slightest idea." I didn't know gout from shout.

For some subjects the embarrassment of the situation had a negative affect on their immediate learning:

> I feel very inadequate when I have to go and see people with no background. I am not comfortable with it. Comfortableness makes it an enjoyable experience, versus

> doing something to get it over with. I probably am more aggressive and assertive, and, consequently, can get much more out of it [experience] when I feel comfortable.

Not having the theoretical knowledg placed students in two problems: (1) they didn't have the knowledge to independently approach the problem solving challenge, so they had to depend on the preceptor to guide them step-by-step, to follow methodically a H/P protocol, and/or look up everything, making their performance slow at best; and (2) they lacked the medical terminology to fully comprehend the explanations preceptors offered, and were unfamiliar with resources from which to efficiently retrieve the information they needed. Without the theory students didn't even "see" what was so apparent to their preceptors, as one Unit II subject's recollection of his Unit I H/P experience points out.

> I think if I see the patient before I know anything, I don't know enough to see what is there. An example of that is the very first hospital history and physical that I did. It was on a lady who they thought had pheochromocytoma--a tumor of the adrenal gland--and I hadn't even taken endocrinology. As I sat there after taking the history and physical and the interns were debriefing me, trying desperately for me to make this association with something that wasn't even there, I realized after they had done all of that and they explained to me what the lady had, that I had missed seeing signs of the disease.

Some students reported drawing upon their backgrounds in science to help them understand new medical problems:

> I have encountered clinical problems before I had the systems course, but I could use my physiology knowledge to get me through. The systems courses give you a differential diagnosis to work from, but I think I have developed my own.

> Oh! I felt fear! Before I had G.I. [system] I had a woman with a gall stone. I figured it out from Anatomy--knowing where the pain was it could only be a couple of things, unless it [pain] was referred.

The students with pre-medical school medically-related training and experience tended not to have the same reactions to these new situations, and for the most part there were not "new" situations in the ambulatory situation. These subjects reported recalling protocols for diagnosis and management they had used in the past.

<u>The affect on learning</u>: However, students were at considerable advantage in the classroom having first had the clinical experience. When asked what they brought to the relevant systems biology course from the previous clinical experience, subjects were quite unanimous in their perceptions, as seen in Table 5.33.

Table 5.33

AFFECT ON CLASSROOM LEARNING OF PRACTICE PRECEDING THEORY

		Percent Response
A	Conjure up mental image of patient	73%
B	Case provides marker and reason for what to learn	63
C	Can remember theory longer	45
D	Can build variations around case	9
E	Case is basis for learning differential diagnosis	18
F	Case is motivator for learning	18

Subjects conjured up mental images of their experiences when lecturers presented the theoretical information about the medical problem. The images were rich in clinical information.

> I can see that woman sitting there. I can see her fat leg throbbing. I can see her face. I can see both of them [physician and patient]. I can hear her telling how it hurts, that her husband was under a lot of stress -he's a farmer. Yes I can!

Projecting mental images of patients was reported by many Unit III subjects as well, some referring to events years before medical school:

> I can still remember the lady with Addison's disease. I will never forget her--I can't remember her name. I can see her standing by the door, telling me that she had to have hydrocortisone or she would die! . . . And then I saw her brown skin.

These cases can become the basis for learning the differential. As one earlier quoted Unit III subject reported, three or four patients continued to provide him the benchmarks of the differential in G.I. disease. Most Unit II subjects did independent study, primarily in clinical texts, around the particular cases, and several reported maintaining personal clinical case notebooks, in which they recorded signs and symptoms, drug treatment and the like. However, these Unit II subjects did not make any special effort to teach themselves the theoretical aspect of the medical problems they confronted; nonetheless the recall of the particular patient was vivid and provided a basis for learning theory in the didactic course.

Subjects also acknowledged remembering the theory longer when it was anchored to clinical experience.

> As far as retention and learning, for me going into the clinical and then going to the systems course works best. I didn't have to go back and look that stuff up--I remembered it... Less work, more efficient, a better educational process. I can't give you right off hand the 6 or 7 criteria for gout, but I can close my eyes and see that lady and then I can remember--and the treatment. That's the anchor for all that knowledge. I never thought about it like that, but it's true. I think if I see it first and then read about it, I remember it better. So the visual aids are really important.

But there are several possible disadvantages to having to perform before having the theoretical base. One, as was noted, is the inefficiency and ineffectiveness of performance. If the performance evaluation is predicated on an assumption of theoretical knowledge which determines a course grade, obviously, the student is placed in academic jeopardy. A second consequence was pointed up in an interview with a Unit III subject. This individual acknowledged that, as a former Physician's Assistant, he had had no problems meeting performance expectations of his Unt II preceptors, but he had, he thought, as hard, and perhaps harder, a time as his classmates in trying to figure out where the theoretical information presented in systems biology courses was going to be relevant in the clinical situation,

> Because I knew what 90% of family practice was all about, and at the time I was thinking of [going into] family practice. So when it got down to a lot of nitty-gritty details, it just went over my head.

This suggests that some very experienced medical students may be limited by the very experience that motivates and guides the clinical competence development of inexperienced students. Whereas, inexperienced students may have no experiential basis for understanding the significance or even meaning of didactic information, experienced students may dismiss such information when it does not jibe with their clinical experience. Perhaps different kinds of clinical experiences are necessary for these experienced subjects in order to modify their perspective of health/ medical care and to increase their receptivity to theoretical information.

Given the two dimensions of students' learning and evaluation [practical and theoretical], it is understandable that they were equivocal in answering the question, "which would you prefer: to have had the systems course or the experience with the medical problem first?" In fact, the clinical experience did not make the difference of passing or not passing the systems courses, since students had learned how to study to pass examinations. It was only in retrospect, as Unit III subjects were able to understand, that students appreciated the value of all of the information that was presented in the systems course. For most students, then, the psychological stress of having to perform without knowledge and the possiblity of being rated as a poor student by the preceptor, were the deciding factors. But as one student observed:

> As long as you see the clinical experience as an opportunity to learn, rather than as a test of what you are supposed to know or be able to do, you can manage to learn something one way or another.

The Effect of Theory Preceding Practice

Unit II subjects described themselves as "having a place to begin" when they had had the relevant systems biology course for the medical problem being confronted. As Table 5.34 reveals, systems biology courses provided students with a good deal of applicable information and skills, provided the student remembered the needed information.

Table 5.34

THE EFFECT OF HAVING THEORY PRECEDE PRACTICE

		Percent Response
A	Have differential to work from	54%
B	Can key in on major signs	63
C	Have few tentative working diagnoses	18
D	have basic pharmacolgoy	18
E	Can problem solve more efficiently	27
F	Have criteria for disorders	18
G	Know references to use	18
H	Understand pathology of disorder	18
I	Know lab tests for problem list	18
K	Provides vocabulary/medical terminology	27
L	Know key questions for systems review	18
M	More comfortable/assertive	18
N	Have certain skills; e.g. read EKGs	9
O	Have basis for asking preceptor questions	9
P	Remember theory when encounter patient	9
Q	Learn and forget	9
R	Current knowledge dominates thinking	9

The systems biology courses present a great deal of information important to understanding clinical medicine. In retrospect the systems courses were seen by students as having been thorough and practical, although that may not have been true at the time they were being studied, as one Unit II subject lamented:

> In retrospect, I wish I could go back and revisit some of those lectures. The most boring and "useless" lectures that we had, and that I didn't attend, the information is all there--it is organized well. Someone gave me a differential; someone gave me treatment and some general management tips. I didn't appreciate it as a second year student, never having been exposed to those things--never having seen someone with peptic ulcer. You can't appreciate all the things that you have to do in the therapies.

Despite their best efforts to learn the vast amount of presented information, Unit II students had difficulty integrating the theory and practice, primarily because the presentation of the theoretical information was incongruent with the presentation of the practical problem. The theory tended also to focus on serious medical problems which students seldom, if ever, encountered in the ambulatory care settings in which they practiced, and when such problems <u>were</u> encountered, they were not likely to coincide with the presentation of theory. This disjuncture in presentation tended to enhance the dichotomy of theory and practice: students attempting to learn, more or less rote, preceptors' protocols for diagnosis and treatment, and faculty's presentation of theory.

Several other intervening variables also appeared to discourage integration of theory and practice: placement of the systems courses and the effectiveness of clinical problem solving study cases. Unit II subjects referred to the importance of the placement of the systems courses from several perspectives. First, the placement of the system courses within the overall curriculum was seen as a factor in understanding the theory presented in the course.

> The reason OB is so fuzzy for me is that I didn't know much about systems and I [have] learned alot from that course to this one. If I were to take OB now, I would be much more comfortable with this issue. The knowledge is cumulative and it overlaps <u>so</u> much.

This insight is in contrast to the typical subject's analysis of his/her difficulty in working up a particular type of case; i.e., the systems course was inadequate or it was studied some time ago and they had forgotten much of the material. While these differences in perspective support what faculty have always contended: students are not good judges of course content, they also support the conclusion that faculty may not realize what (little) students actually understand after completing even the "best" course. Students in this and previous studies have suggested that an "integrating system," such as pediatrics, be offered at the end of the curriculum, so that courses presented early in Unit II can be re-visited. Students have also suggested that integration of theory could be enhanced by progressively placing individual systems biology courses so that each reinforces and extends the theory of the previous course(s).

Integration of theory and practice, then, depends on understanding the theory. It also depends on having the opportunity to apply the thoery in a practical situation. Timing appears to be an important factor. Subjects reported having forgotten much of the theory if the presentation of the clinical case was delayed. To further compound the problem, students do make an effort to immediately reinforce theory with practice, by testing the clinical case against theory currently being studied or against clinical problems they have failed to properly diagnose.

> If I was in a system--Cardiovascular--everything I was looking for was cardiovascular
>
> Absolutely! I do a more thorough work-up on the system I've just completed.
>
> A young man came in the other day... I thought he had a urinary tract infection... but he had mono. I missed it completely. And another patient came in and [the physician] thinks she has mono too. I missed that completely. Mono wasn't in my differential diagnosis; now everyone has mono until proven otherwise!

Faculty have attempted to ameliorate the discrepancy in co-occurrence of theory and practice by including "paper case" exercises in the systems courses and the preceptorship courses. Many of the systems biology courses have small group sessions in which hypothetical clinical cases (CPSSs) are presented for students to work-up. Student reactions to these sessions vary, although almost all subjects of this study reported that the CPSSs provided them with a strategy for problem solving. Table 5.35 shows, however, that the effectiveness of the CPSS in facilitating the individual student's integration of theory and practice could be compromised by the instructional process.

Table 5.35

DESCRIPTORS OF THE EFFECTIVENESS OF THE CPSS IN INTEGRATING THEORY AND PRACTICE

	Descriptor	Percent Response
A	Provided a way to think through problem	82%
B	Provided idea of therapeutics	36
C	Made student think and integrate	18
D	Concerned with esoteric problems	45
E	Not holistic in management approach	27
F	Quality varied by course and instructor	63
G	Schedule already too heavy	9
H	Individual student not held accountable	36
I	Not structured for optimal learning	27
J	Case geared to current system	36
K	No "grey" cases to make student think	9
L	No distinction between hospital and ambulatory care management	9

These statements suggest that the helpfulness of the CPSS to the individual student is dependent upon the CPSS instructional process, which is reported to vary from course to course and from instructor to instructor. Many of the subjects judged the quality of the CPSS on the basis of its practicality; i.e. its usefulness to them in their preceptorship experiences. When CPSS cases represented medical problems which were not seen in the ambulatory care setting, students perceived little was gained from them. Similarly, when the case related obviously to the system under study, they reported the CPSS as not "being like the real world." In these instances the students saw themselves going through yet another didactic exercise that didn't prepare them for the clinical situation. Students attitudes were particularly negative when the time for CPSS sessions infringed on time thought better spent studying for examinations. Some subjects explained that the CPSS sessions didn't help them integrate theory and practice as much as they might have, because the process allowed them to renege on personal responsiblity for thinking through the problem. Too, the "correct solution" to the medical problem was usually limited, failing to take into consideration many theoretical aspects of patient management that students had been taught in other courses.

Similarly, the clinical cases which students wrote up for the preceptorship course were reported to be of limited value, because they received no feedback on their reports. Feedback is a constant quest of students, whether it is in the clinical setting or in college courses. Once students realize that they will get no feedback, they reduce the value they place on the experience and the effort they put into the activity.

These students reactions suggest that exercises designed to help students develop clinical competence must be well conceived; i.e., congruent with students' total educational experiences and with program goals, and provide each student with an opportunity to compare his/her thinking with the ideal.

Explanations for Integration of Theory and Practice

Unit II subjects offered a variety of explanations for their individual processes of integrating theory and practice, as seen in Table 5.36. (See Exhibit N for individual subjccts' explanation.)

Table 5.36

EXPLANATIONS FOR INTEGRATION OF THEORY AND PRACTICE OFFERED BY UNIT II SUBJECTS

	Explanation	Percent Response
A	Use didactic information as basis for problem solving	18
B	Cumulatively understand interrelationships	36
C	Systems courses give differential diagnosis	27
D	Study after see cases	91
E	Clinical practice reinforces theory	45
F	Clinical practice makes learning theory more effective and efficient	54
G	Look for things currently studying in clinical cases	18
H	There are gaps between theory and what is needed in practice	9
I	Forget things if there is a time lapse between theory and clinical case	9
J	Building personal clinical case notebook	27
K	Need someone to help put theory and practice together	45
L	Basic sciences assists in screening of signs and symptoms	18
M	Need model for thinking	27
N	Follow-up of patient helps evaluate problem solving skills	9
O	Pediatrics course could be integrator	9
P	Study clinical texts	45

These descriptors summarize much of what has been previously discussed. Students started with existing knowledge, either cumulative practical experience or such theory as they had gained in systems biology courses. Students then attempted to fill gaps in their existing knowledge in several ways. Inexperienced students attempted to make the patient "fit" their existing theoretical knowledge and read "around the case in clinical texts." Experienced students depended upon their pre-medical knowledge and cumulative systems biology knowledge, and also used clinical texts, such as Harrison's. Both experienced and inexperienced students expressed the need for clinician role models who would both demonstrate how to approach the problem and discuss with the student how they think about the case. In either case, the clinical case provided the stimulus for integration.

Students description of the manner in which theory and practice related to their clinical competence, suggested the following generalizations:

1. The integration of theory and practice is a cyclical process, requiring mutual reinforcement of theory with practice and practice with theory, such that <u>at a given point in time</u>:

(A) THEORY ⟶ PRACTICE ⟶ THEORY ⟶ INTEGRATION
(didactic) (clinical practice) (re-study)

or

(B) PRACTICE ⟶ THEORY ⟶ PRACTICE ⟶ INTEGRATION
(exposure) (didactic) (clinical practice)

a) The cumulative effect of increased knowledge from systems courses and continual clinical experience is a dynamic evolvement of clinical competence throughout Unit II, where:

	Theory / Practice	Theory / Practice	Theory / Practice	Theory / Practice
Term	1	2	3	4

b) The effectiveness and efficiency of the integration of theory into practice is affected by the availability and timing of relevant clinical experiences, clinical instruction and student ability and effort.

2. Integration of knowledge into clinical problem solving competence is dependent upon experience, personal insight and effort on the part of the student and the quality of the pertinent systems course(s).

a) <u>Information</u> given in the systems courses is not <u>functional knowledge</u> until:

. the student has had to apply it,
. someone has guided the integration process--
usually by providing an approach to problem solving in a particular case.

b) The systems courses provide important, relevant information for clinical problem solving. Factors which influence transfer of that information to the clinical situation include:

. the temporal placement of the systems course in the curriculum
. the student's confidence in his/her grasp of the information
. the opportunity to apply the information in a clinical situation
. the immediacy of the relevant clinical practice

c) The patient, either in the immediate clinical situation or as a post-hoc conjured up mental image of past experience, is the most powerful stimulator and motivator of learning and organizing information into functional knowledge.

d) Students, in the absence of immediate, relevant clinical experience, are variously able to organize/integrate information into clinically-operable knowledge. Individual ability to do so seems to be idiosyncratic and may have more to do with general learning/studying styles and degree of dependence on clinical modeling than with premedical clinical experience or academic background.

3. Students use various means to increase their medical science knowledge in order to enhance clinical performance.

a) Students primarily use clinical reference texts to understand clinical problems and their management; those lacking confidence in their science background will review basic medical science texts as well.

b) Some students create "peripheral brains"--clinical case notebooks--as a mechanism for drawing together all of the pertinent features of clinical cases and as a quick reference for future case work ups.

Summary

This chapter has presented the analysis of in-depth interviews of students at three levels of an osteopathic medical education program intended to identify the variables if the process of developing clinical competence. Two central issues focused the interviews and the presentation of findings in this chapter: (1) explanations for competence in performing the history and physical examination and in diagnosing and managing medical problems; and (2) the integration of theory and practice.

Presented for each level of the program were the results of a content analysis of each interview regarding the specific explanations for the clinical competence previously described in Chapter IV. Frequency counts of the coded responses, based on the pre-medical experience of the subject were repesented, as were analyses of statistical correlations of paired explanations. Similarly, the results of a content analysis of Unit II subjects' views of the relationship of theory and practice in developing clinical competence were also presented.

Variables in the teaching/learning process perceived by students at each of the three levels of the program were identified and discussed. The subject's pre-medical experience was seen to influence the manner and degree to which the variables affect the development of clinical competence, just as Chapter IV concluded that such experience affected the subject's clinical competence. In addition, students' perceptions of the relationship of theory and practice and their influence on clinical competence were presented and discussed.

Conclusions and recommendations regarding the implications of these findings for osteopathic medical education and future research are presented in Chapter VI.

CHAPTER VI

INSIGHTS, CONCLUSIONS, AND RECOMMENDATIONS

The present study was intended to provide insight into the nature of clinical competence development through the perceptions of medical students at one college of osteopathic medicine. The study sought, through in-depth interviews, students' perceptions towards answering two central questions:

- Can acquired clinical competence be described for students at the end of each of the three phases of the educational process?
- What factors influence clinical competence development?

The preceding two chapters presented the results of the data analyses as objectively as possible. No particular attempt was made to evaluate students' perceptions, to propose relationships among the issues that emerged or to suggest any implications of the findings for curriculum planners. It was the investigator's intent to present as complete information as possible in order to facilitate the reader's own analysis and conclusions.

This chapter will present the investigator's analysis of the descriptions offered in Chapter IV and V. The analysis attempts to draw from the case study, elements and processes of competence development which need to be considered when attempting to operationalize the theoretical construct of competence-based osteopathic medical education.

The chapter is organized in three parts. The first part will present conclusions drawn from the analysis of students' descriptions of their competence and the conditions of competence development. The second part of the chapter will re-examine the preliminary conceptualization of the continuum of clinical competence development presented in Chapter I. And the third part will present recommendations: first for additional research thought necessary to clarify and extend the conception of the competence-based curriculum model; second, for administrative considerations in developing the curriculum model.

Elements and Processes in the Continuum of Clinical Competence Development

As Chapter IV revealed, students' perceptions of their clinical knowledge and skills are very different at each of the three levels of the program. What they describe as their competence may or may not be what faculty intend, and it may or may not conform to what faculty actually see students do at a particular level. But what students describe are fairly consistent intra-group and inter-group perceptions of competence at a given level. Similarly, Chapter V revealed that students' perceptions of the process by which they did or didn't develop certain competence, may or may not conform with faculty perceptions of the instructional process, but students' perceptions of their experiences are relatively consistent from class to class. It is these consistencies which provide the basis for the conclusions about elements of competence and processes of competence development which need to be considered in developing competence-based osteopathic medical education.

The Elements of Clinical Competence

This study did not specifically describe the clinical competence acquired by students during their undergraduate osteopathic medical education; rather, it identified concepts and issues to be considered in designing a competence-based osteopathic medical education program. Professional competence is multidimensional, at least as described in theory, reflecting the practitioner's cognitive skills, psychomotor skills, attitudes and values, and medical philosophy.

One cannot in reality, of course, separate these various apsects of behavior, but examination of the separate elements facilitates discussion.

Cognitive Skills: Four elements of cognitive competence clearly emerge from the study interviews: medical/scientific knowledge, knowledge of the clinical environment, information processing skills, and self-evaluation skills. The study subjects explicitly described their cognitive skills in terms of "medical knowledge," "knowledge of pathology," and "clinical knowledge." From this perspective there are obvious differences in cognitive skills of students at each of the three levels--differences which, it turns out, made the primary difference in what data was collected and what sense could be made of the data. It seems that until knowledge is perceived as "medical," students do not use existing knowledge to solve problems. For example, few students except those with complete mastery of a particular discipline (as individuals with graduate level training) described using their knowledge of anatomy or physiology to contemplate the meaning of data or to resolve problems with technical procedures. While there was an assumption that the basic science courses are important to understanding "medical" courses, students seldom described using that information to enhance or analyze other skills, like physical examination procedures. First year students, for example, denied thinking through procedures they learned in skills laboratories in terms of anatomy or physiology. They no doubt did apply basic science knowledge in those instances, but not consciously.

A second kind of cognitive skill was implicit in students' descriptions: knowledge of health care delivery systems. With the exception of medically-experienced students, Unit I students had little frame of reference for their tasks when they were placed in the clinical context. They seemed to interpret the context they confronted in terms of existing knowledge, primarily as psychological matters of interpersonal relations. Few interpreted the context in terms of social systems; for example, few saw themselves as intervening in an existing dynamic of nurse-patient-doctor role relationships and sought assistance or approval from all parties. The breadth of perspective of health care systems can carry over into the problem solving skills; for example, seeing patient behavior or illness as simply a psychological pheonomenon limits the depth of understanding and constrains the problem solving perspective. It also may result in students misinterpreting their interaction with the patient, and thereby taking undue responsiblity for problems encountered in attempting to carry out clinical tasks. Unit II students seemed to start very nearly at the same point as Unit I students when they entered their first preceptorship. Inexperienced students initially could not anticipate the processes of the ambulatory care setting and their possible role in that setting. Much of their energy and time in the early preceptorships was spent finding a way to "fit" into the clinical context. With each succeeding experience (term) they gained more empirical information with which to describe for themselves the "ambulatory care delivery system," and as that schema developed they more quickly and effectively adapted to new situations. Unit III students were confronted with a similar learning challenge. At first they had, depending on prior experience, limited knowledge of the hospital setting, and although some aspects of the knowledge of the ambulatory delivery systems transferred to the hospital setting, they had limited ability to anticipate what and how "to do." And, again, with each succeeding rotation they gained more confidence and skill in interacting with the environment. Students who had previous experience through other occupational roles in any of these settings had a cognitive base (schema) that placed them at considerable advantage over their more naive peers. However, this knowledge was constructed from the perspective of <u>that</u> role, not the role of a physician. These students were often on the horns of a dilemma: they had a different perspective from which to view and develop professional skills--often more akin to what the patient and other health workers would have physicians be--but their perspective was often not valued and built upon by physician mentors. Students who continue to operate from this former-role perspective and who do not expand it to a new physician perspective can also hamper their professional development by being unable to consider information which is inconsistent with past experience or by being unable to assertively try tasks they previously were not allowed to do.

A third aspect of cognitive skills, that of the psychological processes of cognition, was less obvious in these students' perceptions. There is a disquieting feeling that some students are functioning at a very low level of cognition throughout their medical training. They used recall and recognition in the first two years of didactic course work and they appeared to at least attempt to use a similar tactic in the clinical arena: they learn protocols for diagnosing and treating, and with repetition they were able to apply those protocols in future similar situations. There is the impression that students generally perceived that there were "right" and "wrong" diagnoses and treatments, and that one had only to recognize the signs and symptoms, and to match them with some "correct" list of problems and first-step treatment--whether the problem was presented as a patient in the clinical setting or as a paper and pencil case in the classroom. This approach is reinforced in some measure by mentors who ask the student, immediately upon seeing a patient who presents in a classical way, "What is it?!" It is assumed in medical education that the student is gaining medical problem solving skills. There is evidence that these students are increasingly able to solve medical problems, but <u>how</u> they solve them is not clear. There is no clear evidence that students gained skills in <u>how</u> to think about professional situations and patient problems, so much as they were being trained in <u>what</u> to think and do when confronted with specific "disease" problems.

And a fourth aspect of cognitive competence, being able to establish standards of practice and guide one's professional development, emerged as an increasing concern of students as they proceeded through the program. These students seemed to make increasing efforts to establish such standards for themselves, but they had little confidence that their goals were realistic. On the other hand, at every level of training there were students who appeared to have little concern about setting personal goals, being confident that what they did was appropriate unless they were specifically told otherwise, or conversely, who assumed they were not performing appropriately if they were criticized. Neither perspective seems to demonstrate that students are developing the important professional competence of self-monitoring and self-development. Of particular interest and concern are individuals (often those with extensive medically-related past experience) who perceived themselves as good as or better than general practitioners in performing routine ambulatory care tasks, and therefore "coasted" through preceptorship experiences. Some of these students appeared not to formulate goals for themselves which went beyond that of their past role or that of their peers.

Conclusions. These insights into students' descriptions of their cognitive development support the following conclusions. First, it is important for curriculum planners to keep in mind that there are different aspects of "cognitive competence," all of which are learned skills and require guided learning, reinforcement, evaluation and continual up-grading. Second, a continuum of clinical competence development should include increasing cognitive skills in thinking and learning, as well as information gathering. It is likely that students can more efficiently independently teach themselves the factual content of a medical curriculum than they can teach themselves how to think and problem solve, to set realistic personal development goals, or to plan and carry out developmental strategies; yet, most instruction is pre-occupied with conveying great hordes of information. Research has consistently shown that, irrespective of the nature of the information, it is quickly forgotten if it isn't utilized in some way which is meaningful to the students. Third, students need some cognitive map of their medical education; one which includes both structure (what courses and experience they will encounter), and function (how those courses and experiences relate to professional competence development). Given only a map of the structure and left to their own devices to figure out how the curriculum can work for their personal professional development, students tend to let the structure dictate function: they develop recall and recognition skills and try to apply them in life situations; they follow course protocols and assume they have learned enough and what is essential; they study for exams rather than to learn. This suggests also that examinations are very influential aspects of the structure of a curriculum.

Psychomotor Skills: Four issues became apparent as students described the development of their technical skills: the dependence of technical skills on cognitive competence; phases of skill development; importance of perspective in defining personal standards of performance; and the impact of the clinical practice environment on competence development. Although this study did not investigate what technical procedures students develop at each of the levels of training, it did concern itself with the physical examination and student's perceptions of their competence in the performance of its individual procedures. Students described an increasing proficiency and comfortableness in the performance of the physical examination. But when one examines what students say, one finds that they are most often talking about the cognitive aspect of the physical examination: knowing what the findings mean; knowing the medical terminology to describe findings; knowing what examinations to do, in what depth, for a particular situation. Cognition is inextricably woven into the psychomotor performance; as was described above, it is medical knowledge that undergirds the concepts of "thoroughness," "accuracy," and "completeness" of a physical examination, whereas psychomotor skills are the basis of the "proficiency" of the performance of the procedures.

One interesting aspect of the development of proficiency in performing the physical examination is the focal point of the learner's attention; what might be called the "self-other" phenomenon. When learning a new procedure students describe themselves as being preoccupied with the mechanics of the procedure itself, to the exclusion of considering either themselves or the person on whom they are performing. They appear to be able to attend either to the person _or_ the procedures _or_ to how they are doing them. For example, while learning new manipulative skills, students are often unaware of the position of their own bodies until it is pointed out to them that their postures are inhibiting them from correctly or more efficiently performing the technique; or, in their intense effort to perform correctly the fundascopic examination they may be unattentive to the patient's discomfort. With regard to the physical examination, this phase of learning is done in the simulation laboratory. When, however, they perform the physical examination on a "real" patient, they become acutely aware of _themselves_ and how they perceive themselves to be seen by the patient. They are more concerned with the overall organization of the procedure than with individual components of each task, which presumably have been mastered. In an effort to at least appear proficient, these subjects tended not to pursue a procedure if it inconvenienced or annoyed the patient, even if they had not collected sufficient or accurate data. While this is likely an artifact of the design of the learning experience (Unit I students assumed it did not matter whether they got accurate data or not), this attention to subjective matters does seem to be a common phenomenon of second stage learners.

For most students this self-conscious stage of performance persists beyond the point at which they have mastered the technical procedures. Not until they have gained confidence in their knowledge, are able to interpret findings reasonably well, can they transcend the procedures and their own concerns to truly attend to the objective features of the clinical situation presented by the individual patient. At this stage there is the risk of the student being preoccupied with gaining accurate and thorough information and dealing with the complications of the problem solving process, and therefore, losing touch with the subjective aspects of the data collection process. Theoretically, as experience and knowledge are gained, the student will be better able to adjust procedures and processes to both the subjective and objective uniqueness of patients; however, most students need guidance as well as encouragement in order to develop this most advanced level of psychomotor skill. The opportunity to encounter clinical situations which require modifications of procedures is essential for developing that competence, but the opportunity must be presented at a time when the student is ready for that challenge. For example, first year students who were confronted with patients who presented complicating conditions (infants, retracted limbs, oxygen therapy, etc.) could not adjust to those situations and were frustrated by them. These difference in stages in learning technical skills are important to keep in mind when establishing standards of performance and when designing clinical experiences. Students will likely be more frustrated than motivated by evaluations which include criteria for performance that are beyond their ken.

Also, early stages of developing procedural proficiency, students are very slow and deliberate. In the clinical settings they are encouraged to and rewarded for increasing their speed. Due to the patient service orientation, in contrast to an education orientation of the clinical setting, physicians cannot take time to supervise students if they take an hour or longer to do a complete history and physical examination. Therefore, if students take the necessary time, they usually do not receive the supervision and feedback they need to improve their skills. If, on the other hand, they attempt to fit into the time constraints of the practice, they either develop strategies to expedite their examinations or perform only part of the total process. In either case the student may be jeopardizing his/her competence development. The most common experience of these students, at all levels, was to have no one attend them while performing the history and physical examination in the clinical setting. Under these circumstances students seem to gain confidence in their ability to establish rapport with patients and no doubt successfully experiment in finding their own interpersonal approach. They do not, however, gain confidence in their own assessments of what and how they should be performing.

Insufficient data was collected regarding the development of competence in performing procedures which are less involved cognitively than the physical examination to contrast their development. A few students described their skills in such technical procedures as drawing blood, suturing, delivering babies, and performing rectal and pelvic examinations. The students often expressed an unexpected (and disturbing) readiness to claim proficiency after only several trials, even if they had been unsuccessful. One interesting difference in male and female perspectives on their proficiency in performing the pelvic examination may point up a variable in developing personal standards of performance. Women students expressed concern for the thoroughness and patient comfort of their performance, whereas male students tended to judge their competence in performing the pelvic examination on the basis of their own comfortableness in doing the procedures. This difference seems understandable, given that males have no cognitive schema for the experience from the patient's perspective. This may suggest that personal experience as the receiver of the professional service may be an important variable in setting personal standards of performance. It also suggests that instruction should attend to subjective aspects of the procedures and be particularly aware of the student's personal perspective. It also suggests that program performance standards must be carefully evaluated to ensure that they consider patient as well as provider perspectives.

Conclusions. These insights into students' descriptions of their performance support certain conclusions regarding the development of psychomotor competence. First, curriculum planners and instructors should keep in mind the distinction between and among the various aspects of task performance: thoroughness, completeness, accuracy and proficiency, and the role cognition plays in each. Since cognitive competence is continuous, task performance must be an evolving competence and should be guided and evaluated according to different standards at each level. Second, the development of proficiency evolves through stages. Early stages of learning are probably best learned in safe, educationally-oriented environments where sufficient time and supervision can be provided; but later stages need supervision and continuous evaluation as well. Early stages of learning can be best supported with simulated patients, where the student does not have to be unnecessarily concerned with the welfare of the patient. Later stages of learning require situational challenges: different contexts and different patient circumstances which require the student to adapt himself/herself and procedures to the extenuating circumstances. Third, self-confidence is an important aspect of competence development which requires independent responsibility for task performance in the clinical setting. However, while the development of self-confidence and personal style are essential components of professional competence, their development at the cost of accuracy, thoroughness, proficiency and adaptibility cannot be supported in a competence-based program. If it is the case that there are stages of psychomotor development, stages that depend on accumulating knowledge, different clinical experiences, and training in the basic procedural technique, different instructional objectives and standards for performance are called for at each stage of the program. Without supervision, evaluation and remediation, students are not likely to successfully progress through all stages of psychomotor development, or to develop valid standards of performance by which to guide their own professional development.

Attitudes and Values: Several themes emerge from the changing attitudes of students: an increasing identification with the physician role; assumption of an orthodox view of medicine; an increasing need to rely on self-teaching; and increasing disassociation from the educational program.

One can sense from students' comments an increasing identification with the physician role and attendant belief systems. Unit I students are just that--students. For all intents and purposes they are lay-persons. They are uncomfortable with medical terminology; many resist using it for fear they will sound silly or will too quickly lose their lay-value orientation. If they had a previous occupational role, they continue to look upon themselves as a "biologist," "nurse," or "social worker" who is in medical school. In any case they view themselves as "pretenders." Much of their energies in their first clinical experience are devoted to dealing with this role conflict. Unit II students are also self-conscious, but as they gain knowledge and skills they begin to see themselves as "being able to be a physician." Unit III students become increasingly intent on learning skills with which to assume next year's responsibilities as an intern. If at the outset of Unit III they adopt a passive student role, they quickly become aware that all too soon they will be D.O.s and will be held personally accountable for being able to perform in that role. It must be kept in mind that Unit III students in this program were involved in a very unstructured clinical training program, one that encouraged, even required, that individual students assertively pursue their own learning through assuming increasing patient care responsibility. In more academically structured and group-oriented clinical training programs, students may not so quickly identify with the physician role.

There also appear to be changing attitudes and values regarding what "medicine" is. Unit I and II students generally are able to explore and/or maintain certain personal ideologic and philosophical views about medical care. During Unit II students are challenged with competing perspectives: systems biology courses are disease and drug treatment oriented; comprehensive patient evaluation and management courses emphasize osteopathic management of health and illness; and preceptors vary in their approach to health. Frequently theory and practice are strikingly different. Nonetheless, through selecting or encountering preceptors who approximate their ideal, students can attempt to reinforce their own views of osteopathic medicine. Unit III, on the other hand, is predominantly hospital-based and specialty-oriented, as will be the internship. It is here that students find out what "medicine" is really all about. Previously espoused notions about "wholism," "continuity of care," and "health maintenance" are no longer reported by the students. They appear preoccupied with learning what they need to survive in the hospital environment. And having become acutely aware of the enormous amount of knowledge one must have in order to "properly practice family medicine," and their limited grasps of even the fundamentals, they begin to think about limiting the scope of their future practice in order to define a managable body of knowledge. In other words, as sociological studies have consistently shown about medical students, osteopathic medical students conform to the concept of medicine prevailing in the practice setting. The students describe that prevailing value system as: defining, diagnosing and treating disease, using the tools of scientific, technological medicine.

Along with this demand to "learn medicine," students demonstrate increased motivation to learn and to manage their own professional development. On a passive-active continuum, Unit I students describe themselves as extremely passive learners-- letting examinations define for them what and how they should learn. Unit II students are somewhere in the mid-ground: lectures and examinations in large measure define what they learn, but they exercise increasing self-direction in when and how they learn it and they are confronted with a new learning challenge in the clinical setting. Unit III students are necessarily the most active learners; for the most part they have to define what to learn, where to find the information, and how to integrate it into the practice of medicine. Students in the Unit III clinical program are also required to develop these skills in isolation from their peers, whereas in Units I and II, teaching was a group process and students generally involved themselves in study groups and/or social support groups. Little social interaction with peers was reported by the Unit III subjects. Some described the isolation as the most difficult aspect of adjusting to the clinical situation. Without peer interaction or the availability of faculty and staff with whom to discuss personal and professional development issues, students are left to their own resources to cope with the pressure of this most important phase of their medical school program. The isolation from college staff and faculty apparently has engendered a sense of alienation. Unit III students express little loyalty to the college; many are excessively critical.

Conclusions. Changes in students' attitudes and values are significant issues for CBE program planners. First, students' ability and willingness to accept responsibility for their own learning and professional development is an important goal of competence-based education. Abrupt changes in demands on independent learning, as experienced when students progress form Unit II to Unit III, create problems for students-- more for some than others. The instructional process should be designed to provide students with the skills needed to assume increasing responsibility for managing their own learning. At a certain point, however, self-reliance may become dysfunctional, since physicians' social role requires that they interact with a network of colleagues in providing care to their patients. Ability to learn from colleagues and to be able to assess the expertise of referring physicians are skills which may best be developed through group learning activities in the medical school.

Second, as students become increasingly more independent learners and self-identified as physicians, it can be expected that they will change their relationship with the college. However, it is expected that administrators would want graduates to leave with a sense of regard and loyalty to the college. Graduates' attitudes towards the college and their education is an important political issue for an institution, for their conception, of what Baldridge (1975) called the "saga" of the school, has a great deal to do with its public support, quality of future candidates, quality of future faculty and, ultimately, the quality of its program. The saga, to a large extent, evolves from the behavior of the graduates and the myths they perpetrate about the school, faculty and curriculum. A professional school, regardless of its curriculum design, is well-advised to be aware of what its graduates think and are saying about their alma mater.

Third, professional education programs can expect that both students and faculty will have varying value systems regarding health, illness, medical care and the physician's role in the health care delivery system. Yet, there must be some agreed upon standards of quality care, student and physician ethics, personal integrity, etc., in order to define standards of performance for competence. In a CBE program, failure to perform according to these standards is evidence of a student's lack of competence. By explicitly stating codes of behavior, standards of care, etc. potential students (and faculty) can make an informed choice about attending such a medical school. Implicit in their acceptance of a position is an agreement to be judged by those standards. Fourth, program goals do reflect certain values and attitudes which must be sustained by the educational program. For instance, a program proposing to prepare osteopathic physicians for general practice should be designed so as to engender and support the values and attitudes, as well as cognitive and psychomotor skills, that denote competence for such practice. Certain of these value issues are directly and inseparably related to the philosophy of medicine which forms the basis for the educational program.

Medical Philosophy: This study began with the assumption that the educational program was founded in the philosophic tenets of osteopathic medicine and, while it was not assumed that all entering students would be fully cognizant and/or commited to those principles, it was assumed that students would develop skills and appreciation for osteopathic medical practice through their course of study. Three impressions were formed from students' comments: Units I and II do increase students awareness, interest and skills in osteopathic medical practice, but Unit III does not reinforce those values and skills; students' perceptions of an osteopathic medical philosophy are variable; and the student selection process is probably the most significant variable in determining who and how many graduates will ascribe to the philosophic tenets of osteopathic medicine.

Across all levels of the program there were subjects who had well thought out conceptions of an osteopathic medical philosophy--although they are not necessarily similar from student to student; there were students who distinguished osteopathic from orthodox medicine by its manipulative therapy modality; and there were yet others who saw no essential or important difference between osteopathic and orthodox medicine. The small percentage of individuals who had specifically sought osteopathic medical training because of its traditional principles, appeared to persist in holding that philosophy across the years of training. Those who had developed, during the first two years, an appreciation for the potential of osteopathic manipulative therapy, were generally persuaded by their clinical experiences that practice guided by those principles is economically impractical.

The prevailing belief of students was that osteopathic physicians do not use a problem solving perspective that is different from orthodox physicians, but they have a useful, ancillary, treatment modality should they choose to use it. While Unit II students have opportunities to work with physicians who utilize manipulative therapy in their practice, Unit III students seldom encounter that opportunity. Generally that opportunity is offered in the Jr. Partnership experience, if at all. Lack of practice with OMT in Unit III causes students to doubt their proficiency, even if they had prided themselves on those skills in Unit II. The issue of problem solving was a different matter. Unless there was clearly a structural problem and it was the chief complaint of the patient, students at both the Unit II and Unit III level, with rare exception, could not describe how an osteopathic physician would approach a medical or health problem differently from an orthodox physician. There are several possible explanations for this phenomenon, including:

- the osteopathic medical problem solving approach is covertly taught and modeled, such that neither practitioners nor students are conscious of its distinctive features;
- clinical faculty do not explicate their problem solving paradigm and therefore students cue on the outcomes of the process;
- there is currently little or no difference in these two medical philosophies;
- the essential difference between the orthodox and osteopathic medical practice is the absence or presence of competence in managing structural dysfunction as a primary health problem.

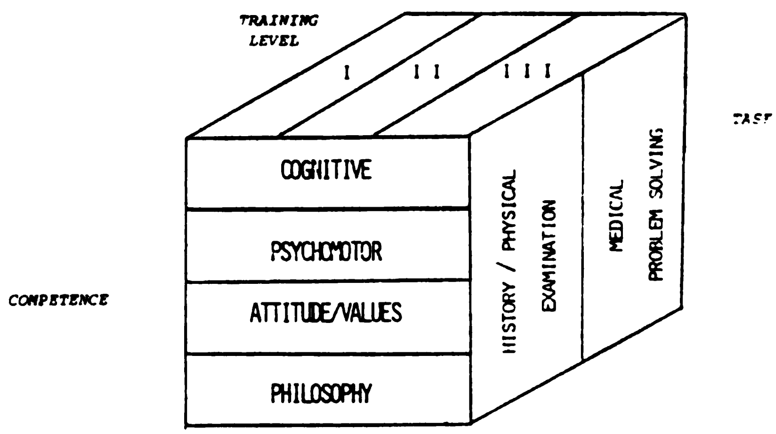
Unit III students expressed considerable dissatisfaction with the political position of the profession with regard to graduate education, expressing the opinion that the profession should approve residency programs, regardless of the sponsoring medical profession, if they meet the criteria of a quality program. They defined quality in terms of: availability of academic teaching, provision of training in research, opportunities for learning innovative approaches to specialty care; the academic credentials of the teaching staff; and/or offering the opportunity to work with sufficient numbers and kinds of patients in the specialty area. These views seem to support the concluding generalization that students increasingly ascribe to an orthodox view of medicine and that, at least in hospital-based care, they cannot/do not distinguish between the practice of osteopathic medicine and other medical philosophies.

Conclusions. These insights into students' perceptions of osteopathic medical philosophy suggest several implications for competence-based osteopathic medical education (CBOME). First, competence-based education, by definition, must be guided by a philosophy, for the philosophy dictates the parameters of competence: skills, values, and knowledge. Without an explicit statement of philosophy a CBOME program cannot be properly designed or evaluated, nor can valid standards of student performance be established. Two, educational programs which prepare students for an occupation are to a large extent defined by the practitioners of that occupation and by societal expectations and pressures. An educational program can, of course, take a particular political or philosophic view with the intent of being an agent for change within that occupation, but planners of such programs must recognize that their students likely will be confronted with differing views when they undertake experiential learning in the community setting. If there is not sufficient reinforcement of the program's principles offered by these mentors, students will likely be socialized to conform to the value system of the practitioner community. Careful selection of both students and clinical faculty is probably essential when the program's principles differ from the societal or professional view. Third, instruction must guide students' attempt to articulate and operationalize a philosophy. If, for example there is an osteopathic approach to problem solving which students are expected to master, faculty must be able to articulate and model the approach, and evaluate students' knowledge and skills in using the approach, in order for students to conceptualize that approach and to develop skills in problem solving using its principles.

Summary: Four continuums of competence which should be defined for each professional task and for each level of the educational program were identified. The relationship of these continuums to the task and training level is shown in Figure 6.1.

Figure 6.1

ELEMENTS IN DEFINING CLINICAL COMPETENCE



The four continuums of clinical competence were proposed to encorporate certain specific elements and/or issues:

1. **Philosophic Perspective.** Not only should the particular medical philosophy guide the content and process of the curriculum, but students should be held accountable for acquiring increasing understanding of its implications for practice and demonstrating increasing skill in performing professional tasks in accordance with its principles. The philosophy must be explicated and modeled by faculty, and clinical experiences should reinforce the philosophic principles and consciously guide students in their operationalization. It is expected that graduates will not only understand but endorse the professional philosophy.

2. **Cognitive Development.** Cognition is the foundation of professional behavior; its acquistion is guided by the individual's personal values and philosophy, as well as by learning experiences. There are at least four aspects of the continuum of cognitive development: formal (theoretical) knowledge acquisition; tacit (experiential/phenomenological) knowledge acquisition (including knowledge of learning/practice environments); information processing skill development; and metacognition skill development (skill in planning, managing and evaluating one's own cognitive development). Competence-based education must be designed to coordinate the development of all essential components of cognitive competence, without assuming that development of one aspect necessarily insures the development of any other.

3. **Psychomotor Development.** There are at least four aspects of psychomotor performance: accuracy, completeness, thoroughness, and proficiency, all of which are dependent on cognitive development and practical experience. Each aspect can, in theory, be defined for a particular level of training and such definitions would be expected to be different from that for the professional level

of competence. Factors varying according to the level of training include: speed, manual dexterity, social-psychological orientation, adaptibility, organization of the task, and cognitive competence.

4. **Attitudinal Orientation.** There are at least three attitudinal elements, in addition to philosophy: those related to students' attitudes and behaviors towards their own learning, those on whom they practice, and the educational program and its staff. Ethics, integrity, self-awareness, responsibility and respect are critical elements of professional competence. Students are presumed to enter medical school with those basic values and behaviors, but the educational program must have clear expectations and provide experiences which allow the individual student to integrate those entering values into his/her professional competence.

Variables in Developing Clinical Competence

It has been the perspective of this study that the design of CBE programs must be concerned with both content and process. The content should be determined by the definition of competence, which, in turn, is guided by the parameters of the professional role and by the philosophy of the program. The processes, instructional, learning and administrative, by which the content is organized and delivered and competence development is facilitated, must be congruent with the program's definition of competence and its educational philosophy.

From students' perceptions of how and why they did or did not develop certain clinical competence there appeared to emerge **six variables in the teaching/learning processes** which affect competence development: students' accumulated knowledge and skills; the clarity of the instructional goals and philosophy; the congruity of goals and philosophy and instructional design; integration of theory and practice; the context of learning; and instruction and role modeling. Each of the variables appears to have some direct and/or mediating effect on the development of clinical competence. Students' descriptions also suggest that the variables are interactive.

Students' Accumulated Knowledge and Skills: This study has persistently pointed to general differences in students' knowledge, skills and perspective at each of the three levels of training, and to specific differences within each group based on the individual student's pre-medical experiences. Cumulative knowledge and skills determined not only what students could do in the clinical situation, but affected how they thought about what they did, what personal standards they established, how they utilized learning resources, and what they expected of the educational program.

It is assumed that all life experience influences what one is able and willing to learn and do in the situation. In the case of these students prior experience in an occupation which practices in the clinical setting and involves knowledge and/or skills similar to that of the physician, was shown to also have a significant influence on what is learned and done. The better able students were to anticipate the practice setting to which they were assigned, the more comfortable they were and, it appears, the more rapidly they adapted to the environment and the better able they were to manage their learning. Similarly, the better able they were to match theory with past experience, the more efficient their cognitive development with regard to scientific knowledge acquisition. Prior medically-related experience provided students with both the "language of medicine" and the "syntax" of that language. That is, while naive students were learning the names of parts of medical science, experienced students could arrange the parts into meaningful relationships. This also seems a plausible explanation for the difference in clinical competence at the various levels of training.

On the other hand, experienced students placed along side naive peers in simulation laboratories or clinical experiences did not necessarily attempt to extend their competence. And extensive experience was even proposed as an explanation for inappropriately weighing the significance of information and valuing the source of that information; i.e., information that did not jibe with the student's experience was given lower priority for learning. One's life experience appeared also to not only guide what was learned, but to guide how one processed information. The impression gained from this study is that students attempt to understand and analyze new information and situations using the perspectives and cognitive skills with which they entered that circumstance. Hence, different students "see" different things and, in effect, learn different things.

Conclusion. These insights support the conclusion that a CBOME program must take into account student' prior experiences. Standards of performance for each of the three levels of the study curriculum should be different. And, since competence is an indiviudal matter, individual standards (within groups) should be different. In theory, differences among individuals should be accommodated by CBE program. For example, simulation laboratories and clinical experiences might be designed differently for certain experienced students, taking into account the advantages and the limitations resulting from such experiences; or, students might be allowed to test out of skills training courses and/or clinical experiences, just as students are allowed to test out of didactic courses. Ideally, the perspective of the student and the manner in which they solve problems would be analyzed so that instruction could enhance the individual's ability to solve medical problems. And ideally, students would be prepared for clinical experiences in such a way that they could anticipate the forthcoming experiences, thus enhancing the educational potential of the experience.

It should be remembered that students do individualize their learning, whether the program intends for them to do so or not. CBE consciously directs that individual effort to ensure professional-level competence, as defined by that program.

Clarity of Curriculum Goals and Philosophy: Students in the study program described at least two areas of program goals and philosophy in which they perceived a lack of clarity: the osteopathic philosophy and the purpose of the clinical experiences.

Presumably the osteopathic philosophy which provides the foundation for an educational program reflects the philosophy of the professional. However, study subjects offered a range of definitions of the osteopathic philosophy, and there appeared to be more uncertainty about its meaning at the later stage of training than at earlier stages. Students entered the training program with or without a clear conception of the osteopathic philosophy and apparently graduated holding a similar view. It appears that the view most commonly held at graduation is that what distinguished osteopathic medicine is manipulative therapy, but that few practitioners employ the treatment modality.

Students also seem not to have a clear notion of the relationship of their clinical experiences to the rest of their educational program. The study supports students' perceptions that Unit I and II clinical experiences are "enrichers' in that the experiences do facilitate integration of theory and practice. The skills laboratories and preceptorships were pointed to as the most appealing aspect of the program--"what makes our program different,"--yet students were uncertain as to the goals of those experiences. The didactic courses were consistently described as having priority over clinical experiences. It is, however, obvious to students that Unit III clinical experiences are intended to help develop clinical competence. Students define competence for themselves by anticipating what they have to do as an intern, not by examining program goals and objectives. It appears that students rather quickly take the view that the Unit III clinical program is not a part of the instructional program of the College, but rather is only administratively linked to the College.

Conclusions. These generalizations bring into focus several issues for CBE planners. It is the assumption of CBE that while the definition of competence is grounded in the current state of the art, it need not be limited to it, and that it is the program goals which define graduate's competence and the curriculum structure and processes. The program goals and processes are described within the particular philosophic framework adopted by the faculty; i.e., the faculty must define an osteopathic educational philosophy and develop program goals and instructional processes which are congruent with those goals. The more explicit those statements, the more effectively the program can be monitored and refined. Students, as well as faculty should understand the rationale for the curriculum design.

The Congruity of the Curriculum with Program Goals and Instructional Design: The ambiguity regarding program goals and philosophy perceived by the study subjects was often explained by them in terms of curriculum design and instructional process. The structure of courses and/or the clinical faculty's perspectives were described as the reasons for students' views on osteopathic philosophy. For example, the separate and distinct courses and faculty which deal with osteopathic diagnosis and therapy were contrasted with courses and faculty that did not integrate or even endorse osteopathic principles. Few students described having experiences in Unit III which reinforced osteopathic principles.

The structure of the curriculum also influenced the way in which students perceived the significance of clinical experiences and what and how they learned. The demands of the didactic program were of primary concern to the students;

since the clinical experiences in Units I and II took valuable time, but offered few penalties or rewards, students devoted most of their time and energy to the didactic program. For example, Unit I students reported conscientious plans to prepare for their first hospital H/P, but invariably they modified or eliminated those plans in favor of studying for exams; and Unit II students attempted to plan preceptorships to accommodate the demands of the didactic program.

Examinations appear to be a potent structural variable. Examinations provide the student with the best indicator of what the curriculum intends for them to learn, how they should learn and what they should value. In Units I and II examinations in didactic courses were given greater priority than were clinical experiences. The absence of feedback, such as was reported for preceptorship case write-ups and Unit I H/P write-ups, resulted in students reducing the effort they put into those activities. The absence of examinations in Unit III did not appear to diminish the value of those experiences, but it did appear to contribute to individuals' uncertainty about competence (theirs and that of certain of their peers). Evaluation, formal and informal, appears to be an critical aspect of competence development.

Students also attributed their difficulties in adapting to clinical learning to the structure of the systems courses. Even though students generally thought the systems approach a good one, and believed that the courses included what was needed for the clinical externship, they expressed frustration with their difficulties in making the transition from learning information organized according to the logic of the discipline to retrieving information required to solve real problems. Unit III students described themselves as being unable to efficiently retrieve and critique literature, to determine what they needed to study and to organize their learning effectively.

Students also contended that adjunct clinical faculty were not fully cognizant of the program goals and the student's stage of professional development. Despite being provided course outlines and objectives, clinical instructors, according to students, did not teach according to those objectives.

Conclusion. These insights add support to the previous conclusion that there are different aspects of the generic components of competence and the CBE curriculum must provide opportunities to develop all aspects. It also is concluded that both the structure of the curriculum and the instructional processes must intentionally guide and reinforce program goals and philosophy. Evaluation is a critical aspect of CBE. For example, if a course in interviewing is included in the curriculum (and is well taught), but clinical faculty do not evaluate students' interviewing competence when performing the history and physical examination, and according to criteria similar to that of the interviewing course, students are not likely to encorporate those theoretical principles within their clinical behavior. Similarly, if osteopathic principles and theory are taught separate from the principles of medicine, and faculty do not teach and model their integration and students are not evaluated on their ability to integrate them, it is likely that students will not develop competence in integrating osteopathic principles in their medical problem solving process. Whatever the program's definition of competence, instruction and evaluation must explicitly address those competence goals. This, of course, means that faculty must be supportive of the program goals and philosophy, and reinforce them through modeling, instruction, and evaluation. There is no expectation that all faculty will hold the same values or weight equally those they do share. However, faculty must be able to endorse the philosophic statement of the educational program; hopefully, they will practice and teach in accordance with that philosophy.

Integration of Theory and Practice: Students describe personal clinical experience as being the most effective means for integrating theory and practice. The integration of theory and practice was usually described in terms of integrating didactic material concerning a particular disease or body system into practice when confronting a clinical case representing that disease or system. The integration of such theory and practice appears to be a circular, rather than linear, process. On the one hand, students having had the theory (of a urinary system for example) described being able to perform more efficiently and confidently when confronted with a clinical problem (of urinary tract infection for example). On the other hand, students who had first encountered the clinical case, described better understanding and retention of theory when it was later presented. To complete the cycle of integration, the student needed to again encounter the clinical situation and be called upon to demonstrate understanding of the theory through performance.

The more complex notion of integration with regard to the interrelationship of body systems in the expression of well-ness and ill-ness, as emphasized in osteopathic medicine, was also identified by students. They credited their accumulating knowledge with facilitating their increasing understanding of the theory and their efforts to integrate that theory into their diagnostic and management performance. Students, however, expressed the need for more guidance and reinforcement in developing this approach to clinical problem solving; guidance which they described as totally or generally lacking, both in didactic courses and clinical instruction.

Students seldom described being held accountable for knowing theory when performing in the clinical setting simulated and/or actual. Nor did they describe clinical problem solving cases (CPSS) in systems courses as being cumulative and integrative.

Certain conditions enhance integration of theory and practice: the co-occurence of their presentation; faculty modeling; explicit reinforcement of theory in didactic and clinical courses; increasing responsibility and accountability for (integrated) competence; and recall of patient images. Conversely, certain curriculum structures and instructional processes were described as inhibiting integration: skills courses not drawing on and evaluating knowledge of principles offered in basic and medical science courses; basic science courses not offering clinical examples; clinical instructors not reinforcing theory; clinical mentors modeling medical problem solving which is not consistent with theory; courses arranged without regard for their conceptual relationships; time lapses between theory and practice; and discontinuation of training and evaluation in basic skills.

Conclusion. The insights of study subjects commend a number of features to a CBE program in osteopathic medical education. First, the logic which prescribes the relationship of courses and experiences should derive from the competence the program intends to develop; competence being viewed as multidimensional and transdisciplinary. Neither courses/disciplines nor experiences can be considered ends in themselves. Nor is it satisfactory to assume that competence gained from each of a series of courses and/or experiences will be transferred to other courses and experiences, or that the sum total of that competence is professional competence as defined by the program. Both the structure of the currriculum and the instructional process must explicitly facilitate integration of accumulating theory and students must be held accountable for integrating theory and practice both in the didactic and the clinical setting.

The Context of Learning: The environments in which students performed clinical tasks defined what students were expected and able to do. Each unit of the study curriculum presented students with increasingly complex medical problems, commensurate with their increasing knowledge and skills, thus facilitating continuing development of clinical competence. Certain features of specific environments were described as inhibiting competence development: simulation laboratories provided limited opportunity for Unit I students to confront abnormal physical findings; non-ambulatory, hospitalized patients posed problems for Unit I students attempting to perform history and physical examinations; patients seen in preceptors' offices seldom presented with problems currently or previously studied in didactic courses; hospital-based patient care training in Unit III seldom concerned itself with certain issues presented in the on-campus program such as comprehensive health care or osteopathic diagnosis and therapy; and any given clinical preceptorship or rotation might be unproductive for a student due to: a limited number of patients or limited type of medical problem; too high a patient service demand on the clinical instructor; inability or unwillingness of the clinician to teach to the student's level; personality or value conflicts between the student and clinician and/or staff; patients' unwillingness to participate in the student's learning experience; and lack of a didactic component in the instruction. Learning experiences were also described as unproductive when the student was unable or unwilling to understand and adapt to the environment.

Conclusion. One of the precepts of CBE is that the learning environment must be supportive of the student's learning needs. These students' descriptions of their clinical experiences points up unique problems for competence-based, community-based osteopathic medical education programs. The number and kind of patients which will be seen by a clinician and the clinician's approach to care cannot be controlled by the College. Thus coordinating clinical and didactic experiences is difficult, if not impossible. However, the program administrators and faculty are responsible for ensuring that graduates have achieved the competence described by program goals; they must, therefore, anticipate and address problems inherent in the curriculum design and limitations of the resources available to the program. Curriculum planners can design strategies to enhance student learning such as:

- enhancing simulation laboratory experiences through the use of such tools as A-V materials, trained simulated patients, and a patient bank;
- orienting students to clinical environments before they are expected to perform in them;
- explicating the types of patients which particular students should and should not perform on;
- utilizing on-campus faculty for teaching in the clinical setting, particularly at the initial stages of each phase of training;
- developing protocols which outline preferred procedures for obtaining patient cooperation;
- making every effort to establish a cadre of informed, loyal and effective clinical adjunct faculty;
- providing students with explicit guidelines regarding their clinical competence development, standards of competence, and the purpose of the current experience;
- providing mechanisms by which students can be assured of a productive clinical experience;
- developing mechanisms for evaluating and remediating students' clinical competence deficiencies on an on-going basis;
- enhancing the theoretical content of clinical rotations through the use of such instructional strategies as: developing CAI programs for each rotation; arranging group study projects; evaluating cognitive competence; offering instruction in particular clinical management problems using a workshop approach to instruction; rotate clinical students through the campus program at strategic points; etc.

Instruction/Role Modeling: Many of the issues related to the influence of instruction and role modeling on students' competence development have already been pointed out: consistency of personal philosophy with that of the program; familiarity with, commitment to and ability to reinforce the goals and objectives of the program; skill in articulating, reinforcing and modeling integration of theory and practice.

Students at all levels of the study program described dependence on instructors for their clinical competence development, although the degree and kind of instructional assitance varies according to the students' level of program, life experience and personal needs. Inexperienced students at each level described needing more specific instruction, direct supervision, and explicit feedback than did medically-experienced students. The focus of the instruction depended upon the students' level of training: Unit I students-- understanding basic principles and techniques of the history and physical examination; Unit II students--integating accumulating knowledge in the performance of the H/P and developing a medical problem solving paradigm; and Unit III students--refining the H/P and medial problem solving skills by integrating accumulating knowledge and skills of clinical medicine. Also the amount of clinical experience appeared to affect the student's ability to deal with ambiguity and variations in instruction and clinical modeling.

Students described wide variations in instructors' awareness and skills in meeting students' different learning needs. Students viewed their competence development as being hampered if they were <u>not</u>: given clinical responsibility commensurate with their abilities; taught and held accountable for increasing skills in performing tasks, including the H/P; assigned learning/service tasks which enhanced their clinical competence development; offered explanations for clinical decisions made by mentors; given appropriate task assignments and/or not given feedback which facilitated their improving performance; and provided sufficient time to gain the necessary knowledge to understand clinical problems. These factors in learning were described as applying to all levels of clinical training and certain of them applied to didactic courses and assignments as well. And as has been pointed out, the adjunct faculty are particularly influential in the students' socialization into the professional role.

<u>Conclusion</u>. These insights reinforce conclusions previously made. Program designers and faculty must have a clear conception of the differences in students' learning needs and competence at each level of the program. Faculty must be familiar with and support the goals of the program and the objectives which are expected to teach. Individuals who teach in the clinical setting (both similated and

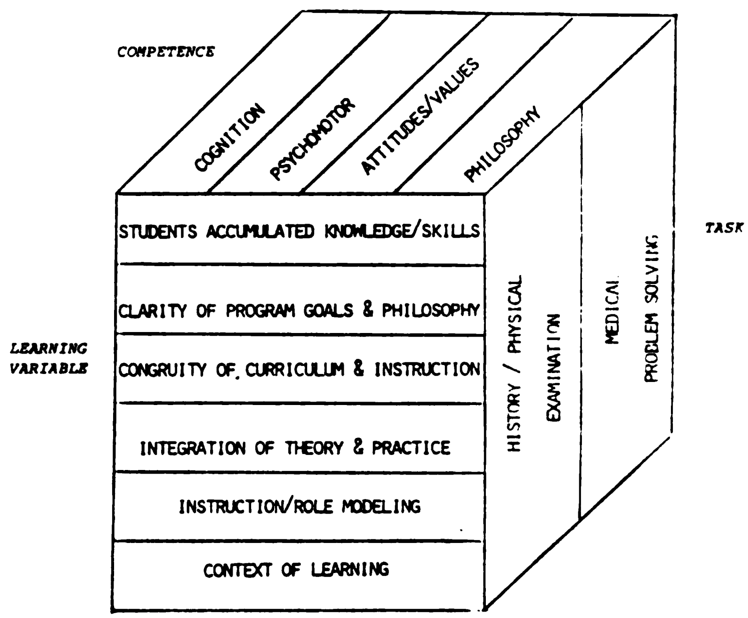
real) are probably the most important faculty within a professional program. These individuals must be fully aware and committed to meeting the special learning needs of the students with whom they interact, and they must understand and accept the responsibility for the competence of their students. Competence-based education program administrators, in turn, must take responsibility for ensuring that students have instructors who not only are appropriate role models but who can and do teach according to program objectives. It is doubtful that students can effectively learn, particularly at the first level and at early stages of succeeding levels, from either poor role models or poor teachers. Program planners should, therefore, take steps to optimize clinical instruction, for example: make program goals, objectives and philosophy clear to both faculty and students; establish standards of practice by which to evaluate potential instructors; conduct faculty development programs; devise reward systems for good instructors; carefully select/match instructors and students; mediate instructor-students difficulties; and make certain that students are prepared for the clinical learning situation.

Summary:

Six variables in the clinical competence developmental process were identified. The relationship of these variables to the professional tasks studied and the continuums of competence previously described, is shown in Figure 6.2.

Figure 6.2

DEFINING CLINICAL COMPETENCE FOR AN INDIVIDUAL AT ONE LEVEL OF TRAINING



The six learning variables were proposed to incorporate certain specific issues:

1. **Students' Accumulated Knowledge and Skills.** Accumulated knowledge, skills, and behavior (competence) appears to be the most significant variables in learning. At each level of training, students gain knowledge and skill which enables them to "see and do" from a unique perspective. With each succeeding phase of training, knowledge and skills accumulate so as to change both the perspective and competence with which professional tasks are undertaken.

Although certain general differences in competence can be defined for each level of training, individual student differences transcend these general boundaries. Since competence is defined in terms of what students know and do, not what they have heard or seen, individual differences in competence are likely more significant than usually thought by planners of traditional programs. It is proposed that students' competence both affects and is affected by the other variables.

2. **Clarity of Program Goals and Philosophy.** The CBE program goals state the parameters of competence graduates must achieve. Medical students are highly motivated and capable, and given a clear conception of what it is they are to do, they can guide their learning towards those ends. If the program goals are not clear to faculty and/or students, it is unlikely that their energies will be directed towards program goals. When program goals are ambiguous, individuals pursue personal goals.

3. **Congruity of Curriculum and Instructional Design with Program Goals.** It is essential that the design of the curriculum and the instructional processes are congruent with the program goals and philosophy. Certain structural features of the educational program (especially examinations and course relationships) and process features (especially modeling and reinforcement of theory in practice) direct what and how students learn, and therefore, must be carefully designed in order that program goals be achieved.

4. **Integration of Theory and Practice.** Practice which reflects the integration of theory is the hallmark of professional competence. Curriculum designers must consider factors in curriculum design, course design, instruction and evaluation which influence how effectively students are able to integrate theory into practice. Modeling and verbal reinforcement of theory by clinical instructors, co-occurrence of theory and practice, and evaluation which holds students accountable for integrating theory into practice were shown to be important factors in students development of professional competence.

5. **Context of Learning.** The clinical setting offers the most challenging and rewarding learning for medical students. Each clinical setting, including the simulated laboratory, presents the student with unique learning opportunities and

challenges. Curriculum planners of CBE programs should provide an environment which optimizes students' learning. A number of factors appear to be involved in determining the appropriateness of the learning environment: the student's knowledge of the environmental context; the patient's acceptance of the students; the appropriateness of the medical problem for the student's level of competence; the clinical instructor's acceptance and ability to carry out the faculty role; and the appropriateness of the clinical training for the program goals.

6. **Instruction/Role Model.** Regardless of how well a program is defined and designed, it is the instructional process which effects student learning. Through selection of instructional objectives, instructional techniques, role modeling, interpersonal interactions with students, and imposition of evaluation criteria, the faculty overtly and covertly convey to students what they should know and how they should behave. Practitioners (those in the community setting) appear to have the most influence on students in a community-based educational program. Curriculum planners must carefully select and train clinical faculty, and arrange students' experiences in order that program goals can be achieved.

Implications for Competence-Based Programs

Programs intentionally designed to produce professionally competent osteopathic physicians must carefully define what they intend through both explicit statements of standards and criteria of student competence, and statements of philosophy, goals and curriculum rationale. In order to effectively operationalize and maintain the intended program, certain issues related to the instructional process need be considered.

First, all constituents of the program must understand the program goals, philosophy and curriculum rationale. Second, program designers and faculty must have a clear conception of the differences in students' learning needs and competence at each level of the program. Third, every effort must be made to facilitate students' integration of theory and practice in all learning situations, through verbal reinforcement by instructors, co-occurrent practice and theory, modeling and evaluation mechanisms. Fourth, faculty must be familiar with and support the goals of the program and the objectives which they are expected to teach. Fifth, individuals who teach in the clinical setting (both similated and real) are probably the most important faculty within a professional program. These individuals must be fully aware and committed to meeting the special learning needs of the students with whom they interact, and they must understand and accept the responsibility for the competence of their students.

Sixth, competence-based education program administrators, in turn, must take responsibility for ensuring that students have instructors who not only are appropriate role models, but who can and do teach according to program objectives. It is doubtful that students can effectively learn from either poor role models or poor teachers, particularly at the first level and at early stages of succeeding levels. Program planners should, therefore, take steps to optimize clinical instruction by: making program goals, objectives and philosophy clear to both faculty and students; establishing standards of practice by which to evaluate potential instructors; conducting faculty development programs; devising merit systems for good instructors; selecting/matching carefully instructors and students; mediating instructor-student difficulties; and making certain that students are prepared for the clinical learning situation. Seventh, students' professional development must be monitored and guided by evaluation consistent with the program goals and philosophy.

Implicit in these notions of competence-based education is the single imperative that the structure and function of the program must be directed by and towards the program goal: the defined competence of graduates. Specific faculty, department and discipline educational goals must be consistent with and contributive towards that program goal.

Reconceptionalization of the Continuum of Clinical Competence Development

The study began with an a priori conception of the continuum of clinical competence for the students in the case study program. The study intended to both test the viability of that conception and to identify variables which affect that developmental continuum. The study revealed certain inadequacies of the initial conceptualization and identified variables related to the student, environment and instruction that affect the developmental process.

The Conception of Clinical Competence Development

Chapter I presented a preliminary conceptualization of the continuum of clinical competence development, and a statement of the relationship of the level of training to the elements which describe the continuum (presented here as Figure 6.3 and Table 6.1). While the conceptualization does reflect the apparent fact that there are differences in competence at each of the three program levels, the study revealed certain weaknesses in the preliminary statement: (1) it does not accurately reflect the complex nature of clinical competence; (2) it does not describe the nature of the differences in competence at each level; and, (3) it does not clearly convey the difference in individual (actual) competence at a particular level of training.

The study revealed that, without a clear statement of program goals framed within the program's medical philosophy to guide the development of clinical competence statements (course objectives), students inferred standards of performance from modeled behavior--which might or might not be consistent with program goals. Thus, lists of professional tasks (as listed for element B in Figure 6.3), do not convey the multi-dimensional nature of competence, nor can they convey to students and faculty the specific definition of competence espoused by the educational program. Given a clear definition of terminal competence, however, the preliminary statement could provide a framework for conceptualizing an intended continuum of clinical competence for the study curriculum.

The differences in students' clinical competence at each of the three levels are not accurately conveyed in the preliminary statement due to the lack of: (1) a definition of terminal competence just mentioned, and (2) adequate descriptions of the students' response mode (elements H -M, Figure 6.3). The study revealed that students do the same tasks differently, as well as doing different tasks at each level; thus, responses such as accuracy (J), efficiency (K), confidence (L), and ethics (M) would need to be defined differently for each level. For example, the program should expect a high level of accuracy in student performance at all levels, however, accuracy for the Unit I student would probably be defined in terms of accurate placement of instruments, accurate descriptions of observed findings, etc. Whereas, for the Unit III student, accuracy might be defined in terms of recognizing and correctly pursuing pertinent clues, correctly interpreting findings, etc. In a similar fashion, the definition of the specific professional task (element B, Figure 6.3.) would vary at each level of training, based on the intended accumulated competence of students at each level.

Such a conceptualization, even if properly defined, cannot adequately define or predict individual student's competence at any point in time. The study suggests that learning conditions must be optimal in order for intended learning goals to be achieved. To the extent that the program cannot control the teaching/learning processes--which, of course, it cannot expect to do totally--individual competence will deviate from the program goals.

Figure 6.4

CONCEPTUALIZATION OF THE RELATIONSHIP OF THE VARIABLES IN THE PROCESS OF COMPETENCE DEVELOPMENT

A student's development of clinical competence depends on his/her accumulated competence

(A) Competence

- a^1 skills in learning
- a^2 implicit knowledge
- a^3 tacit knowledge
- a^4 psychomotor skills
- a^5 problem solving skills
- a^6 values/attitudes
- a^7 medical philosophy

specifically related to:

the <u>environmental context</u>

(B) Environmental Context

- b^1 participants and their roles
- b^2 organizational process
- b^3 instructional/learning process

; the assigned <u>task</u>

(C) Assigned Task

- c^1 collect medical history data
- c^2 elicit chief complaint
- c^3 conduct physical examination
- c^4 write report
- c^5 self-evaluate
- c^6 interpret data
- c^7 propose problem list
- c^8 plan/conduct diagnostic tests
- c^9 propose diagnosis
- c^{10} plan/implement treatment
- c^{11} plan/implement management
- c^{12} educate patient/family

; the <u>problem confronted</u>

(D) Medical Problem

- d^1 normal
- d^2 structural
- d^3 hematologic
- d^4 neurologic
- d^5 respiratory
- d^6 endocrine
- d^7 gynecologic
- d^8 cardiovascular
- d^9 renal
- d^{10} gastrointestinal
- d^{11} dermatologic
- d^{12} psychopathologic
- d^{13} multisystem

; and the <u>factors</u> in understanding health and illness

(E) Factors of Health and Illness

- e^1 biologic/physiologic
- e^2 psychologic
- e^3 sociologic

but the efficiency and effectiveness of competence development is mediated by factors associated with:

<u>program goals</u>

(F) Program Goals

- f^1 clarity
- f^2 congruity with practice
- f^3 congruity with philosophy

; <u>curriculum design</u>

(G) Curriculum Design

- g^1 congruence with program goals
- g^2 congruence with student's learning goals and process
- g^3 co-occurrence of theory and practice
- g^4 reinforcement of concepts and principles

; <u>instruction</u>

(H) Instruction

- h^1 instructional approach
- h^2 modeling
- h^3 criteria for performance
- h^4 testing/evaluation
- h^5 reinforcement of theory
- h^6 integration of theory and practice
- h^7 teacher skills and commitment
- h^8 congruence with program goals

; and the student's ability to manage own professional development

(I) Professional Development

- i^1 understand program rationale
- i^2 set personal goals
- i^3 establish realistic standards
- i^4 evaluate self
- i^5 develop and carry out learning/remediation strategies

Variables in the Continuum of Clinical Competence Development

The study revealed a number of factors which influence students' actual competence development. The relationship of these factors can be conceptualized using a Guttman mapping sentence (as in Figure 6.4). As in the conceptualization of the continuum of clinical competence development, this conceptualization provides curriculum planners with a way to think about the variables which affect competence development, but it does not offer any guidance in predicting their actual affect on individual students. At best, the conceptualization can make the planners aware of the complexity of the process of competence development. As yet, too little is known about the student-environment interaction to more specifically suggest relationships among variables.

CONCEPTUALIZATION OF THE RELATIONSHIP OF THE VARIABLES IN THE PROCESS OF COMPETENCE DEVELOPMENT

A student's development of clinical competence depends on his/her accumulated competence

(A) Competence

- a^1 skills in learning
- a^2 implicit knowledge
- a^3 tacit knowledge
- a^4 psychomotor skills
- a^5 problem solving skills
- a^6 values/attitudes
- a^7 medical philosophy

specifically related to:

the environmental context

(B) Environmental Context

- b^1 participants and their roles
- b^2 organizational process
- b^3 instructional/learning process

; the assigned task

(C) Assigned Task

- c^1 collect medical history data
- c^2 elicit chief complaint
- c^3 conduct physical examination
- c^4 write report
- c^5 self-evaluate
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- c^{10} plan/implement treatment
- c^{11} plan/implement management
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- d^{11} dermatologic
- d^{12} psychopathologic
- d^{13} multisystem

; and the factors in understanding health and illness

(E) Factors of Health and Illness

- e^1 biologic/physiologic
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but the efficiency and effectiveness of competence development is mediated by factors associated with:

program goals

(F) Program Goals

- f^1 clarity
- f^2 congruity with practice
- f^3 congruity with philosophy

; curriculum design

(G) Curriculum Design

- g^1 congruence with program goals
- g^2 congruence with student's learning goals and process
- g^3 co-occurrence of theory and practice
- g^4 reinforcement of concepts and principles

; instruction

(H) Instruction

- h^1 instructional approach
- h^2 modeling
- h^3 criteria for performance
- h^4 testing/evaluation
- h^5 reinforcement of theory
- h^6 integration of theory and practice
- h^7 teacher skills and commitment
- h^8 congruence with program goals

; and the student's ability to manage own professional development

(I) Professional Development

- i^1 understand program rationale
- i^2 set personal goals
- i^3 establish realistic standards
- i^4 evaluate self
- i^5 develop and carry out learning/remediation strategies

Recommendations

Despite the current study's limitations, due to small sample size and descriptive design, the results of the study raise questions appropriate for further study. Also, the insights gained from the review of the literature and students' perceptions suggest issues to be considered by administrators of competence-based osteopathic medical education (CBOME).

Recommendations for Further Study

The current study suggests a variety of studies necessary for extending the theory of CBOME, as well as developing specific programs. From the point of view of this investigator, the studies should be "naturalistic," rather than experimental, in order to develop a grounded theory for competence-based education and to prescribe content and processes for a particular program.

Certain general information not now available is needed in order to develop a competence-based osteopathic medical education program. Studies are necessary to:

- describe the osteopathic medical problem solving paradigm;
- describe terminal statements of competence for graduates of osteopathic medical schools;
- describe terminal statements of competence for graduates of the specific program under development.

And certain more specific information is needed in order to develop competence standards and instructional strategies for each of the specific levels of training within a competence-based program. Studies are needed to describe:

- problem solving competence of students at each level of a program;
- variables attending the process of establishing personal performance standards;
- <u>observed</u> students' clinical performance at each level of the program.

Recommendations for Program Administration

Few medical school curricula have been developed following the precepts of competence-based education, although all medical schools are presumed to graduate individuals who are acceptible for admission into the profession; that is, who are "competent." This study has shown that at least for subjects in the study case, actual outcomes can vary widely among graduates of a single program. How and to what extent these outcomes vary from the program's intentions or the profession's or society's expectations, is not revealed in this study. What is revealed is that curriculum structure and instructional processes are significant variables in students' competence development processes and outcomes. Administrators of professional educational programs have, as Dressel has pointed out, a social obligation to insure "that each individual undergoing a professional program be held to reasonably well defined and acceptable standards" (1979:4). In order to insure such outcomes, programs must be designed to insure competence, and maintained so as to stay current and vital.

Competence-based osteopathic medical education can be expected to be difficult to design and to implement, for its principles demand ways of thinking which are counter to many academic traditions:

- **the focus on instruction and learning (and evaluation) is on professional competence, not merely on the discipline knowledge that underlies that competence;**
- **program goals and objectives must take precedent over departmental and discipline goals and objectives when designing courses and instructional methods;**
- **program policies, such as evaluation, remediation and the like, must be consistent with the philosophy and goals, and be uniformly applied across the program, taking precedent over contrary individual faculty policies.**

Designing and implementing a competence-based program will require certain educational administrative processes:

- **describing the conception of competence-based education being operationalized by the program, addressing certain issues:**
  - **policies regarding the design of the curriculum and the process of instruction;**
  - **the competence to be demonstrated by students in process and graduates;**
  - **the criteria to be employed in assessing student competence;**
  - **the criteria and policies for assessing the program;**

- **clearly defining consensual program goals and philosophy, and ensuring congruence of program content, structure and instructional processes;**

- **establishing administrative policies (including faculty and student recruitment, retention and promotion), which support the program goals and philosophy;**

- **working closely with faculty, including those in the clinical setting, to insure understanding of and commitment to program goals, philosophy and objectives;**

- **developing effective mechanisms for monitoring and adjusting the program to changing events.**

The current study pointed up issues which may be of particular concern to administrators of community-based osteopathic medical education programs;

- **the medical philosophy espoused by the program must be understood and endorsed by all faculty, and modeled and/or reinforced throughout the instructional process;**

- **innovative strategies to attain the commitment of voluntary faculty to program philosophy, goals and objectives are required.**

<u>Maintaining CBE programs for osteopathic medical education</u>: As Magen (1981) has pointed out, osteopathic medical education programs can be properly designed and operationalized, but over time cumulative changes in personnel and courses can significantly alter the program. Magen, thus, points to one of the crucial and most difficult aspects of curriculum administration: sustaining the integrity of the program while responsibly adapting to change.

A maintenance program "health maintenance plan" for CBE should at least include:

- **orientation of all prospective faculty and students to the program's philosophy, goals, curriculum design and rationale;**

- **periodic faculty review and re-orientation to the program philosophy and goals;**
- **preview of all proposed changes to assure their correspondence with program goals and philosophy;**
- **review and evaluation of all program changes;**
- **periodic comprehensive evaluation of the program;**
- **feedback to faculty and administrators, and implementation of necessary modifications in program content/structure/processes.**

It is essential to the integrity of any program, but particularly innovative programs, that the people "fit" the program. Research has shown that innovative programs at first attract creative, motivated individuals seeking change, but not necessarily the specific change proposed by the particular program. The innovative program often provides the medium for such individuals to carry out personal innovative agendas, the cumulative effect of which is dilution and diversification of program goals. Such undesirable outcomes are likely due to the lack of clarity of stated program goals, philosophy, and rationale, and/or failure to convey those intents to faculty and student candidates. Once "aboard," students and faculty will need continuous reinforcement of the nature and importance of the underlying assumptions of the program.

Reinforcement of program principles is best effected through vigilant preview and review of all program operations and changes. Some collegial mechanism for scrutinizing the appropriateness of proposed changes and on-going operations must be devised. Typical curriculum review committees of professional programs are often ineffectual in maintaining the integrity of the program for any of a number of reasons among them: members represent discipline/department interests; certain members inevitably have more status and power; the charge of the committee is not clearly stated or understood; program goals, philosophy, and curriculum design and rationale are not clearly stated or understood; members do not ascribe to the program goals and philosophy; the relationship of the committee to administrative offices is not understood or maintained. It is imperative for CBE programs that such a committee be given and accept the responsibility for maintaining the integrity of the broad program goals and philosophy as stated, by:

- previewing all proposed changes for their congruence with program goals and philosophy;
- maintaining a comprehensive program evaluation program;
- holding administrative offices responsible for implementing necessary changes.

Evaluation is the key to maintaining the integrity of the program. Too frequently educators presume evaluation of student achievement and constitutent's compliance with procedureal rules to be sufficient. Program evaluation must be comprehensive and substantive. Equally important, the outcomes of such evaluation must be made known to those concerned, strategies for correction must be designed and implemented, and re-evaluation of the remedial action must be conducted. As Dressel (1979, 1981) has suggested such evaluation processes should address all aspects and constituents of the program, including evaluation itself.

In sum, competence-based education presents a difficult challenge to osteopathic medical educators--made particularly difficult by the fact that too little is yet known about what "competence" means, and by the fact that traditional structures and perspectives of medical education, together with the practice of medicine often countermand the necessary change. It does seem, however, that it is a challenge that the profession can no longer afford to ignore.

APPENDICES

APPENDIX A

UNIT I INTERVIEW SCHEDULE

UNIT I - SELF ASSESSMENT OF CLINICAL PERFORMANCE

History and Physical Examination in OST 532

Interview Schedule-Student

A. Experiential Background

1. In what capacity have you "worked" in a hospital or other health care facility?
2. Had you performed interviews and/or physical exams in a clinical/work situation prior to your medical school experience?
3. What experiences have you had that you think gave you some advantage in undertaking the hospital H/P experience?

B. Preparation

1. When you received notice of the assignment what were your general feelings about the task: anticipations, goals, concerns, feelings of confidence, etc.?
2. How did you prepare for the task: practice, organize interview schedule, check equipment, talk with upper class persons, etc.?

C. Introduction to Clinical Setting

1. Describe your reception and orientation to the hospital.
2. What was your reaction to that experience?
3. Describe how you were assigned to a patient and any briefing you had regarding the patient.
4. How was your introduction to the patient managed?
5. What were your reactions/feelings at this point?

D. Clinical Performance: Interview

1. What was your PRE-plan for conducting the interview: order, time, note taking, etc.?
2. What was your assessment of the patient and how did that affect your plan?
3. Describe your history interview protocol.
4. What went especially well? Why, do you think?
5. What could have gone better? How?

6. What, do you think, was the patient's attitude and reaction to the approach you used?

E. Clinical Performance: Physical Examination

1. How had you intended to carry out the physical examination: process, time, degree of completeness, etc.?

2. Did any circumstances develop that required you to modify your plan? Describe.

3. Describe your physical exam protocol.

4. What went especially well? Why, do you think?

5. What could have gone better? How?

6. Which aspects of the physical exam are difficult for you to perform? To interpret?

F. Evaluation

1. Compare your findings and interpretation of the H/P with those of the physician. How do you explain those differences?

2. Describe the evaluation session with the supervisor.
   a. What kind of feedback was helpful to you?
   b. What <u>would</u> have been helpful?

3. Were there any aspects of this assignment for which you felt unprepared? How could you have been better prepared?

4. What did you learn from this experience: about yourself, H/P, hospitals, etc.?

5. As a result of this experience what goals have you set for furthering your clinical skills?

6. Are there any modifications in the teaching or evaluation in the CPE series (OST 530/1/2) that you would recommend? What? Why?

7. What is a logical next step in your clinical skill development?

APPENDIX B

UNIT II INTERVIEW SCHEDULE

UNIT II - SELF ASSESSMENT OF CLINICAL PERFORMANCE

Clinical Performance in the Preceptorship

Interview Schedule

A. Experiential Background (prior to entering MSU-COM)

1. Describe any health care provider role in which you had worked or for which you had been trained.

2. Describe tasks you'd performed that are similar to those you have performed in clinical skill labs (OST 530/531/532) and preceptorships.

3. Describe any experiences you have had that you think may have given you some advantage in the preceptorship.

B. Preceptorship/Clinical Experiences

1. What systems courses have you completed?

2. How many "official" preceptorships have you undertaken?
   a. On what basis did you select each preceptor?
   b. What, for you, characterizes a good preceptorship experience? Is it different for each successive experience?

3. How many "unofficial" or elective preceptorships have you undertaken?
   a. Why did you elect each of those experiences?
   b. How were they better or worse than the official preceptorships?

4. In what ways did the knowledge gained in the systems courses relate to your clinical experience?

5. How have the clinical experiences extended your knowledge of "systems"?

6. What seems to work best for you: to have the systems course precede experiences with a particular clinical disorder, or, to work with the disorder in the clinical setting before having the theoretical material presented in the systems course? Why?

C. Skill Development

1. I would like you to compare your H/P skills at the end of Unit I (when you did the hospital H/P in Ost 532) with your current skills:
   a. How have your medical history skills changed?
   b. With what procedures of the physical exam do you feel proficient? Are the procedures "automatic"?
   c. How have you changed the protocol or approach when doing the H/P?
   d. For which procedures do you feel comfortable interpreting your findings?
   e. What aspects fo the H/P do you feel uncertain about or you think need further practice?

2. I would like you to describe your diagnostic and treatment planning skills:
   a. First, what opportunity have you had to "work up" a patient?
   b. Are you able at this point to propose tenetative diagnoses at the end of the H/P for most patients?
   c. Are you able at this point to propose treatment plans for most confirmed diagnoses?
   d. List the types of clinical cases/disorders you feel most comfortable working up.
   e. How have the systems courses helped develop your diagnostic and management skills?
   f. What difference is there between "working up a patient" and "working up a clinical case" such as presented in CPSS sessions in a systems course or as assigned in the preceptorship syllabus?
   g. In what ways has working up a patient in a preceptor's office been difficult?

D. Clinical Competency Development

1. How do you know which skills you need to gain or to improve?

2. What particular experiences have facilitated your clinical competency development?

3. What particular experiences have inhibited your clinical competency development?

4. Is there some order of skill development that you think should guide the sequence of preceptorships?

5. What are the minimum skills that an osteopathic medical student should have gained by the end of Unit I in order to take full advantage of Unit II experiences?

6. What are the minimum skills that an osteopathic medical student should have gained by the end of Unit II?

7. What is your current notion of what osteopathic medicine is? How is that different from the view you held coming into MSU-COM?

8. How is and/or should be the osteopathic philosophy incorporated into clinical competency development within the MSU-COM curriculum?

APPENDIX C

UNIT III INTERVIEW SCHEDULE

UNIT III - ASSESSMENT OF CLINICAL PERFORMANCE

Clinical Competence in Externship

Interview Schedule - Student

A. Experiential Background

1. Describe any experience you have had as a health care provider prior to entry to the MSU-COM program.

2. How did those role tasks differ from similar ones performed by the osteopathic physician?

3. Describe any other prior experiences you've had that you feel gave you some advantage in learning or performing clinical tasks in the program.

B. Preparation for Externship

1. Describe the nature of the "official" preceptorships you undertook in Unit II.

2. Describe the number and nature of "unofficial" clinical preceptorship/ clerkships you undertook in Unit II.

3. Describe your clinical skills coming into Unit III re: H/P, diagnosis, treatment planning, patient management, office management, technical skills.

4. How do you think your skills compared to your average classmate's skills?

5. What, if anything, should you have learned that you did not in Units I and II in order to be prepared for Unit III?

C. Externship Competency Development

1. Describe the order in which you undertook the Unit III rotations.

2. Which rotation was <u>most</u> productive in terms of your skill development? What do you think made that rotation particularly growthful?

3. Which rotation was <u>least</u> productive in terms of your skill development? What do you think made that rotation so unproductive?

4. What are the essential skills one should develop during the base hospital rotations?

5. What are the essential skills one should develop during Jr. Partnership?

6. Describe your clinical skills at this point in time, re: H/P, diagnosis/ problem solving, patient management, technical skills.

7. In which professional tasks do you have the confidence that you will be able to assume internship-level responsibility?

8. What, if any, skills should you have learned in the program but did not in order to confidently enter internship?

D. Professional Development

1. What is your current philosophy of osteopathic medicine and how, if at all, has that changed since you entered MSU-COM?

2. How has that view been supported or refuted by your student experiences?

3. What are your goals for the internship year?

4. What have you learned about your own process of professional development and how will that guide your future development?

5. Had you to do it (the program) all over again, how would you organize or guide your professional development through the undergraduate medical program?

EXHIBITS

EXHIBIT A

UNIT I H/P COMPETENCE

Exhibit A

UNIT I H/P COMPETENCE

UNIT I CATEGORY	PROFICIENCY	DEFICIENCY
I	#1 Had 9 basic questions to ask #2 Feel good about palpatory skills #3 Comfortable with interview; Comfortable with systems review - logical; Thorough job; Zeroed in on chief complaint; Could discern abnormals #4 Had H/P protocol	#1 Didn't know how to do pediatric exam; Couldn't hear murmur (heart beat too fast); Didn't follow protocol; Problems with eye exam #2 Didn't do PE - patient balked; Didn't feel enlarged spleen #3 Uncertain about heart sounds #4 Feel weakest with lung and heart sounds; Couldn't see anything on fundascopic
II	#5 History was very smooth; Comfortable handling instruments; Comfortable with procedures #6 Comfortable with the interview; Did an excellent social history; Comfortable with palpatory exam of abdomen; Have the basics of eyes exam; Use laymen's terminology to describe many findings; Can see what I am supposed to see; Comfortable with equipment	#5 Could have forgotten to ask key questions; Review of systems questions hard to think of; Uncertain about identifying pathology; Couldn't see much in eyes; Didn't have the background for right questions #6 Don't know anything about heart sounds; Insecure about lung sounds; Can't label pathology/abnormal findings "Don't know what I'm seeing"; Uncomfortable with OMT; Didn't see myself as physician
III	#7 Know how to look like I know what I'm doing; Recognized abnormals; Could define abnormal	#7 Couldn't control review of systems--didn't know what questions to ask; Uncertain how much could press patient (was complaining of pain); Uncertain about verbalizing instruction; Need more experience with lung sounds; Can't use medical terminology
IV	#8 Followed protocol of H/P; Could ask more questions in area of pre-med training #9 Confident of PE skills; Followed 'crib sheet'	#8 Not comfortable in physician role; Didn't know how to work around injured knee; Didn't know most appropriate questions for review of systems; Have trouble with fundascopic exam; Little "rusty" with PE; Couldn't hear murmurs #9 Didn't perform if patient reluctant; Fundascopic exam questionable; Auscultation questionable; Didn't modify environment to facilitate structural exam; Routine pre-occupies thought; Not sure about review of systems
V	#10 Comfortable with skills; Pursued clues around C.C.; Comfortable in environment #11 Comfortable with skills; Comfortable with sitting; Integrated H/P; Recognize pathology; Starting to get Dr. perspective #12 (Prior experience as P.A.) #13 (Prior experience as P.A.) #14 (Prior experience as R.N.) #15 Enjoyable; Followed crib sheet; Looked for different things to learn	#10 Not comfortable with Dr. role; Glossed over review of systems #11 #12 #13 #14 #15 Couldn't visualize fundoscopic

EXHIBIT B

UNIT II H/P COMPETENCE

Exhibit B

UNIT II H/P COMPETENCE

UNIT II CATEGORY	PROFICIENCY	DEFICIENCY
I	#1 Comfortable with routine procedures Good pelvic Pretty good chest exam Good ear exam Good vital exam OMT is better #2 Palpatory skills better Structural exam really improved More observant Less intrusive in doing exam Separating own feeling from tasks Really confident of PE skills including fundascopic Can do EKGs Good at drawing blood #3 Have normals for most PE procedures #4 More proficient in all PE procedures except fundascope Better interpretation of findings Accuracy of information Good at reading x-rays Little difficulty with pelvics Comfortable with Brinkerhoff rectal exams Can do: I.V., draw blood put in Caths, give I.M. injections Differential on low-back pain	#1 Not so good fundescopic Not good rectal Not good endoscopic Need better chest exam #2 Psychiatry evaluation #3 Need practice on fundascopic Had no experience doing male genitalia exam Not sure about palpation #4 No progress with ophthalmoscope - can only see red reflex & vessels
II	#5 Comfortable with mechanics of P.E. #6 More confident Use of x-ray machine Certain OMT techniques Pelvics & rectals #7 Perfectly confident in doing well-baby P.E. Confident on breath sounds Can get good histories Efficient at getting pertinent information Good at injections #8 Confident of validity of findings Therapeutic OMT	#5 Uncomfortable with pelvics Need practice on whole H/P - forget things Not sure what all to do on each patient Don't visualize everything in eye #6 Eye exams Interpreting finding of pelvic Subtleties of palpation Heart sounds Haven't done suturing #7 Palpatory skills Pelvics Heart sounds Complete H/P Dictation of H/P Writing prescriptions #8 Rectals - anxiety Accurate descriptions Write ups - what to include Diagnostic OMT
III		
IV	#9 Comfortable with H/P Comfortable doing ENT exam Comfortable doing heart and lung exams Pretty comfortable doing the rectal and pelvic exams Pretty comfortable palpating abdomen Percussing is O.K.	#9 Histories incomplete Eye exam
V	#10 Had the procedure down before COM Interpret findings #11 Have own system for PE Had history skills before COM Accuracy of palpation and percussion of liver Feel competent in interpreting findings respiratory, heart, abdomen (with history) Comfortable with musculoskeletal exam Recognize and describe abnormalities	#10 (None described) #11 Fundascopic - can't visualize everything Abdominal palpation Neurological work-up Labeling abnormality

EXHIBIT C

UNIT III H/P COMPETENCE

Exhibit C

UNIT III H/P COMPETENCE

UNIT III CATEGORY	PROFICIENCY	DEFICIENCY
I	#1 Had H/P "down pretty good" #2 (Interview not complete)	#1 (None described) #2 (Interview not complete)
II	#3 Strongest in history taking - getting complete information - 2 hours #4 More proficient with H/P; Know more about diseases so can ask more specific questions; Know abnormal from normal #5 (None described) #6 Good basic H/P; Knew more questions to ask; Better at distinguishing abnormal form normal	#3 Not efficient #4 PE skills not as good should be #5 (None described) #6 Cardiology evaluation; Neurology examination
III		
IV	#7 Thorough H/P; Thorough, accurate H/P record #8 Can do adequate history; Can do pretty thorough PE; Can identify general system #9 H/P much improved - takes 20 minutes; Pride self on PE skills; Could get people to talk; Get basic information for general identification of problem	#7 (None described) #8 Problem determining specific H/P for more refined analysis of system, especially cardio-vascular and respiratory; Not good at describing things if not familiar with them #9 General lack of indepth knowledge of medicine so miss some refined clues (signs & symptoms)
V	#10 Confidence level increased 100%; Had skills down for clerkship #11 Elicit pertinent history & PE information on all systems including C.C. and things patient didn't perceive as relevant; Have identified "packages" of signs & symptoms for generic problems of all systems; Generally assess cardiovascular status; Write good set of history & PE notes	#10 (None described) #11 Slower at writing up orders & note than want to be - not automatic yet; Uncomfortable with semi-independent responsibility in FP

EXHIBIT D

UNIT II DIAGNOSIS & TREATMENT COMPETENCE

Exhibit D

UNIT II DIAGNOSIS & TREATMENT COMPETENCE

UNIT II CATEGORY

PROFICIENCY

I

#1
Had opportunity to work up patient in most systems
Trusted myself to develop case
Get good H/P, propose problem list
Be in ball-park most of time

#2
More efficient and confident of diagnosis in cardiology system
Can get through problem list with other system using references - using time
Know drug of choice for cases seen
Can look up drugs

#3
If it is one problem, can deal with it - remember and look up
Working on putting knowledge of systems together with patient present

#4
Trying to learn list of most frequent G.P. cases
Not bad on diagnosis using reference

II

#5
Every week have to work up patients
Get problem list devel. if case straight forward for given system
Comfortable with uncomplicated upper respiratory G.I., hypertension, PID
Can figure out drug treatments with PDR

#6
Some opportunity to problem solve
Can identify system(s) of C.C.
Can usually develop list of possible problems
Feel more comfortable problem solving in respiratory system

#7
Do patient work up in Migrant Clinic all the time
Have a problem list for each system in head
Trying to develop problem list for symptoms

#8
Had opportunity in last preceptor
Problem list is in general terms
Know certain drugs docs always use
Can work through most gyn problems
Can develop problem list with time and references

III

IV

#9
I have worked up lots of respiratory, cardio, musculoskeletal, derm
I have worked up some OB, renal. They are all O.K.
Develop differential on basis of probability of occurence
Have general idea how to treat common problems
Have drug regimens in mind.

V

#10
Having more success in developing problem list and diagnosis
Am comfortable working up patients in any system except neurology (hypothetical cases)

#11
Have treatment plan for types of cases seen
Can propose rationale for diagnostic test for differential
Can readily identify "problem" system
Include "osteopathic" (structural, psychological) evaluations and differential considerations

DEFICIENCY

I

#1
Uncertain about working up patient in renal & respiratory
Patients at either end of age spectrum are problem

#2
Don't know 2nd, 3rd choice drugs

#3
Block out the material on treatment
Multi system - multiple problem patient can't deal with

#4
Don't know drugs at all
Don't know treatment
Bumble with children under age 5
Have trouble with people who don't speak good English

II

#5
Can't problem solve if case is multi-system or ambiguous
Don't remember drugs from one week to next

#6
Trouble refining problem list to probable problems
Unfamiliar with diagnostic tests
Feel very vulnerable in renal & peds
I may be off on my problem list good % time

#7
Working with things never heard about or seen
Cannot deal with things that don't fit lists I have

#8
Don't have the "right" (medical) names for problems
Take a long time to work up case
Don't really know drug classification

III

IV

#9
Have not worked up Neurology
Not comfortable working up derm.
If classical question don't point to problem, am in trouble
Don't know drug dosages
Often forget to ask important questions
Can't work up or treat "vague symptoms"

V

#10
Not comfortable working up neurology cases

#11
Can't propose treatments if haven't previously worked with case
Can describe abnormality but not specifically label it

EXHIBIT E

UNIT II DIAGNOSIS & TREATMENT COMPETENCE

Exhibit E

UNIT III DIAGNOSE & MANAGEMENT COMPETENCE

UNIT III CATEGORY	PROFICIENCY	DEFICIENCY
I	#1 Could organize information into a few possible problems Could do initial workup - initial diagnostic test Start initial treatment regimen Could read chest and abdomen X-rays #2 (not complete interview)	#1 Couldn't manage full work-up of patients EKG shakey Couldn't manage <u>new</u> diabetic Had no appreciation for peds Good evaluation for back pain Treat diabetic acidosis Work-up anemias, renal disease, cirrhosis Appreciation for many medical problems #2 (not complete inverview)
II	#3 Getting handle on drugs for certain problems Evaluate x-rays (routine) Basic admitting orders Some idea of management for certain emergency problems Produce differential with 5 or 6 possibilities Trying to think holistic Quick differential for emergency problems #4 Can handle COPD from beginning to end Write better progress notes than most people #5 Could handle problems from beginning to end in G.I., cardio-vascular Can work up hematology problems #6 Problem solving improved Had work-up protocols for pulmonary, G.I., cardiology Had routine treatment plan for specific problem	#3 Not know dosages Weak in producing good differential Distressing to work from PE alone (comatose) Admitting orders not routine #4 Don't have enough basic medical knowledge Don't write good enough progress notes #5 Neurology Orthopedics #6 Don't know dosages unless done many cases Still learning refined tricks of exams & interpretations Handling respiratory distress
III		
IV	#7 Self confident Have a protocol for managing emergencies Know specific drugs for specific common problems Know admitting orders for routine problems #8 Define basic problems and their management Usually figure out problem Had knowledge to handle emergent problems - M.I. #9 Know diagnostic tests for diseases included in differential Could handle acute M.I., read EKG; handle arrhythmias Could get along with people Differential in general system diagnosis	#7 Didn't know details of I.V. therapy #8 Variations in treatments for basic problems, e.g. diabetes Deficient in drugs, especially dosages, and antibiotics If problem not what thought, was "just lost" Lacked <u>confidence</u> to take charge of management of emergent problems #9 Feel deficient in differential-diagnosis in Medicine - don't know diseases Afraid of a code Don't know cardiovascular drugs Don't feel good about daily management of patients Don't know anything about I.V. therapy, hyperalimination, nutrition Differential not indepth
V	#10 Knew basic protocols for managing/treating chest pain, hypertension, septic shock - emergencies Had most of the skills down for the internship #11 Can put more specific labels on things Develop pretty accurate list of 3 or 4 possible problems in differential for systems which rotation in Address patient even if problems complex List of possibilities not necessary comprehensive in all systems Rudimentary grasp of what lab & exams pertain to order for diagnostic work-up Manage patient on ventilator Can keep my head in chaotic situations	#10 (Learning different techniques of doing what can do - and developing proficiency in techniques) #11 Exercising independent responsibility of decision making Developing priorities for what needed to order Differentials in neurology & dermatology & ophthamology, infectious disease, OB. Not yet developed a personal rationale for specific diagnostic work-up Not sure of technical skills, e.g. suturing for ER

Exhibit E

UNIT III DIAGNOSE & MANAGEMENT COMPETENCE

UNIT III CATEGORY	PROFICIENCY	DEFICIENCY
I	#1 Could organize information into a few possible problems Could do initial workup - initial diagnostic test Start initial treatment regimen Could read chest and abdomen X-rays #2 (not complete interview)	#1 Couldn't manage full work-up of patients EKG shakey Couldn't manage new diabetic Had no appreciation for peds Good evaluation for back pain Treat diabetic acidosis Work-up anemias, renal disease, cirrhosis Appreciation for many medical problems #2 (not complete inverview)
II	#3 Getting handle on drugs for certain problems Evaluate x-rays (routine) Basic admitting orders Some idea of management for certain emergency problems Produce differential with 5 or 6 possibilities Trying to think holistic Quick differential for emergency problems #4 Can handle COPD from beginning to end Write better progress notes than most people #5 Could handle problems from beginning to end in G.I., cardio-vascular Can work up hematology problems #6 Problem solving improved Had work-up protocols for pulmonary, G.I., cardiology Had routine treatment plan for specific problem	#3 Not know dosages Weak in producing good differential Distressing to work from PE alone (comatose) Admitting orders not routine #4 Don't have enough basic medical knowledge Don't write good enough progress notes #5 Neurology Orthopedics #6 Don't know dosages unless done many cases Still learning refined tricks of exams & interpretations Handling respiratory distress
III		
IV	#7 Self confident Have a protocol for managing emergencies Know specific drugs for specific common problems Know admitting orders for routine problems #8 Define basic problems and their management Usually figure out problem Had knowledge to handle emergent problems - M.I. #9 Know diagnostic tests for diseases included in differential Could handle acute M.I., read EKG; handle arrhythmias Could get along with people Differential in general system diagnosis	#7 Didn't know details of I.V. therapy #8 Variations in treatments for basic problems, e.g. diabetes Deficient in drugs, especially dosages, and antibiotics If problem not what thought, was "just lost" Lacked confidence to take charge of management of emergent problems #9 Feel deficient in differential-diagnosis in Medicine - don't know diseases Afraid of a code Don't know cardiovascular drugs Don't feel good about daily management of patients Don't know anything about I.V. therapy, hyperalimination, nutrition Differential not indepth
V	#10 Knew basic protocols for managing/treating chest pain, hypertension, septic shock - emergencies Had most of the skills down for the internship #11 Can put more specific labels on things Develop pretty accurate list of 3 or 4 possible problems in differential for systems which rotation in Address patient even if problems complex List of possibilities not necessary comprehensive in all systems Rudimentary grasp of what lab & exams pertain to order for diagnostic work-up Manage patient on ventilator Can keep my head in chaotic situations	#10 (Learning different techniques of doing what can do - and developing proficiency in techniques) #11 Exercising independent responsibility of decision making Developing priorities for what needed to order Differentials in neurology & dermatology & ophthamology, infectious disease, OB. Not yet developed a personal rationale for specific diagnostic work-up Not sure of technical skills, e.g. suturing for ER

EXHIBIT F

H/P SKILLS DEVELOPMENT

Exhibit F

H/P SKILLS DEVELOPMENT

UNIT II STUDENTS CATEGORY	UNIT I				UNIT II			
I	#1 (None described)	#2 Didn't know what was doing Didn't know terms 3 hrs. to do complete H/P Write up excessive Everything equally important Chart what don't see or hear History, then PE Concerned with patient	#3 Sympathetic Got no information Concerned with patient Affected by patient Structured protocol Anxious about protocol Complete H/P goal Go through motions Awkward procedure Procedural conscious Not see or hear	#4 Ask memorized list (H and PE) No idea how to tie together Not going anywhere Ritualistic "Student perspective" Quit if takes too long Don't know pathology, so can't identify normal	#1 C.C. History 10 minutes Can take short cuts Systems review with PE Head to toe PE Smoother PE PE geared to C.C. Distinguish var. in abnormality Mechanics of PE under control Know procedural variations	#2 Communication better 1½ hr. to do complete H/P Know terms Write-up concise Confident Use protocol Know importance of information Mostly C.C. H/P Take action so can see/hear Integrate C.C. H/P Concerned with accuracy Know normal from abnormal	#3 Empathic Get information Less structured protocol Can adapt to [illegible] Know info you need C.C. H/P goal Understand systematically what see/hear Usually distinguish normal/abnormal Not necessarily distinguish var. in abnormal Sometimes understand medically what see & hear	#4 Trying to get info Things make sense Get clue and chase it down Focused on chief complaint Can identify systems of C.C. Extend history if PE shows something PE pretty pat Always do cardiovascular - "catch all" gives clues More proficient with PE proc. except eye exam Listening more carefully "Doctor" perspective Stick with procedures to get info Slow
II	#5 Go by list Use standard form Didn't know what info meant Take 1-1½ hr. for HE Didn't have technique of eye exam Didn't know what was listening for	#6 Follow protocol Didn't know anything I saw Back off if not see or hear things Concerned with self	#7 Ask everything Write everything done No idea of what info added up to Follow top to bottom protocol	#8 Reliant of piece of paper - protocol No right to impose self on patient Apologetic Go through process Worry about mechanics Not "read" cues	#5 More things to ask More comfortable if forget Routine more engrained Now start with systems review Developed own style Record only abnormals Know what & why of questions Not sure of all info needed Take less time - 30 - 45 min. Get pertinent info More competent with eye exam - see 1/2-3/4 of what should Same PE protocol Probably miss things	#6 Focus on chief complaint Get info pertinent to Dx C.C. Est. rapport before H/P of C.C. Do certain things routinely - for practice Beginning to figure out pt's stage of illness Forgotten things don't use - e.g. OMT exams of joint Focus PE from history Know what else (C.C.) to investigate More efficient use of time Pursue history from PE Pursue info even if difficult Personal inquiry/patient response	#7 Focus on C.C. for H&P Focus questions on invest. C.C. Have differential in head History is shorter/precise May focus on hypoth. diagnosis too much More finesse in questions May miss things Integrate part of H&P More confident Picked up "tricks" of doing certain procedures	#8 Focus on C.C. Quicker, more organized More confident Forming idea of how to put pieces together Better questions for that have had "Hear" & "see" more Seeking information Know what to look/feel/listen for in PE Separate H & P Remember what forgot Pick up subtle clues More accurate dicription Know criteria of finding 50% accuracy on finding pathology

EXHIBIT G

UNIT II H/P COMPETENCE
DESCRIBED BY UNIT III STUDENTS

Exhibit G

UNIT II H/P COMPETENCE DESCRIBED BY UNIT III STUDENT

UNIT III CATEGORY	PROFICIENCY	DEFICIENCY
I	#1 Pre-natal checks #2 Beginning to distinguish abnormal	#1 No handle on anything Not able to evaluate patient Not able to do good PE Not able to home in on C.C. #2 Miss subtle findings
II	#3 Ask routine questions Identify system of C.C. Explain something about possible problems (anatomical/physical/pathological) Gather data from H/P Recognize abnormal Some labels for abnormal #4 Decent H/P--good as average D.O. Organize a C.C. Identify system of C.C. Make decent problem list #5 H/P geared to C.C. Could ask in-depth questions in system review for current system #6 Good history/thorough Physical exam was improved/pretty good Recognized abnormal Described abnormal in medical terms usually Limited facility in proposing problem list Good basic systems review	#3 Not able to home in on C.C. Weak in interpreting data Heart sounds interpretation #4 Miss some things in H/P Problems developing problem list in neurology, respiratory, dermatalogy Can't do adequate pelvic exam #5 Didn't feel competent #6 Neurologic exam not good Feel inadequate in all areas Knowledge weak in OB, orthopedics, ophthamology
III		
IV	#7 Complete H/P organized/flow Separate H and P intentionally Developing problem list easily History protocol consistent with pre-MSUCOM process plus social history #8 Do extensive H/P Good general history/PE Go through procedure Identify system of C.C. if simple problem Identify simple problems in general terminology Comfortable with pelvic exam #9 Identify system of C.C.	#7 Tend not to know what looking for Can't see forest for trees Disappointed in manipulative skills (spec: thrust) #8 Can't weed out unimportant Can't proceed beyond general Not always recognize abnormal Not always have medical label for findings Identify simple problem, but #9 Didn't know what was important Couldn't integrate H/P Weak physical exam skills: chest sounds, palpatory skills, medical terminology for signs neurological exam, not know other possibilities pelvic exam
V	#10 H/P same as when a P.A. Broader, longer problem list Feel comfortable with all routine office situations #11 History directed towards C.C. Asked correct, general questions PE "wasn't bad" Recognize signs and symptoms in crude sense Identify 2 or 3 most likely problems	#10 (None described). #11 History wasn't well-directed/not efficient PE not efficient H/P not integrated

EXHIBIT H

EXPLANATIONS FOR UNIT II H/P COMPETENCE

Exhibit H

EXPLANATIONS FOR UNIT II H/P COMPETENCE

UNIT II CATEGORY	PROFICIENCY	DEFICIENCY
I	#1 Got to do a lot on my own (OMT) Lots of cases - (pelvics) Am assertive Have own goals #2 Was taught the tricks Positive reinforcement Practice - enough examples/cases/opportunities Individual effort-honesty about skills Est. learning plan Personal support system Self-confidence Critical feedback #3 Est. self confidence Was taught the tricks High expectations of of teacher with positive reinforcement Opportunity to do it Had knowledge base #4 Personal goal Spend time practicing with teacher Repetition/reinforcement of instruction/practice Increasing self-expectations Opportunity to do Continuous, positive reinforcement Critical self-evaluation	#1 Limited pathology seen #2 Restriced practice patient base No repetition No patient follow-up Don't have knowledge base Stress in personal life #3 Intimidated by preceptor Slow practice - little to do Not allowed to do (male gen. exams) Attitudes of peers, faculty, preceptors (sexism, racism) #4 Demands of "real" practice practice No interest - not ready to consider Skill not valued by clinicians Irrelevant didactic preparation
II	#5 Practice Non-threatening learning environment Adequate knowledge base Learn "tricks" Feedback on performance Honest self-evaluation #6 Constructive feedback Practice Responsibility Integration of knowledge & practice Experience with pathology Have some overview of problem/process Self-confidence Personal interest #7 Repetitive practice Have pertinent knowledge base Personal interest Self-confidence Expose to pathology case Self-initiative #8 Background/Interest Confidence Have background knowledge/interest Practice/Repetition Reinforcement of theory/practice Feedback/critique Verification of findings	#5 Intimidating instructor Lack of practice Not forced to do things #6 Demands of "real" practice No feedback Lack of confidence in knowledge base Lack of exposure to pathology Timing of knowledge acquisition re: of continuum #7 Demands of "real" practice Shyness - hesitancy to ask to learn #8 Lack of opportunity to practice Time lapse between experiences Demands of "real" practice Not know expectation
III		
IV	#9 Repetitive practice Knowledge base present Verification of skills and findings Taught "tricks of trade"	#5 Lack of opportunity to practice Lack of pathology in clinical cases No clinical modeling Lack of positive and negative feedback
V	#10 Pre medical training/experience provided competencies Expanded knowledge base #11 Pre-medical training/experiences provided competencies Able to assume responsibility High self-expectations Honest/accurate self-evaluation Practice/Repetition Personal goals/self-teaching Confidence	#10 Demands of "real" practice Quality of MSUCOM instruction weak #11 Poor instruction in MSUCOM Lack of clinical cases with pathology Lack of clinical medicine knowledge Restricted practice Lack of consistency among clinical faculty Personality conflicts increases lack of opportunity to practice

III

IV

#9
Follow complete list - 2 hours for H
Didn't know enough to tailor H/P
Don't know what looking at
Self conscious about order of protocol/leaving things out
Not recognize pathology

#9
Focus on C.C. - 10 min.
More effective history - know the questions
<u>Less</u> effective in DPT
<u>PE</u> skills improved 100%
Know when to do thing re: C.C.
Sometimes do procedures (PE) just for practice
Comfortable with most procedures
Use a PE protocol routinely
Confident will find pathology if ever "seen" it

V

#10
Pre-occupied by "physicians" role
Confident in doing History of C.C.
History less complete - effective
H had incidental relevance to patient
Had learned PE procedures prior to MSUCOM

#11
Competent in history skills
Knew the questions to ask
Smooth manner
Get adequate information
Had routine systems review questions for acute illness
Separate H & P because MSUCOM required it
PE procedure mimiced physician

#10
Comfortable enough with role to 'hear' and 'think' about patient and information
Questions more pertinent, precise, with finesse
Better able to distinguish subtle abnormalities
Palpatory skills better
Selectively exclude procedures re: C.C.
Organization according to pre-med training

#11
Include chronic disease issues in review of systems
Focus towards and from differential diagnosis
Integrate H/P
Refinement of selection of pertinent questions and information
Mentally go through "flow chart" of differential
Flow chart set up on basis of priority, i.e. seriousness of hypothesis
Blocks of questions direct thought process
Developed own PE system
Can interpret PE findings if hav history date
Recognize & describe abnormality - not nec label

EXHIBIT I

EXPLANATIONS FOR UNIT II COMPETENCE
DESCRIBED BY UNIT III STUDENTS

Exhibit I

EXPLANATIONS FOR UNIT II COMPETENCE DESCRIBED BY UNIT III STUDENTS

UNIT III CATEGORY	PROFICIENCY		DEFICIENCY	
I	#1 Did a lot of OB pre-natal exams in one preceptor	#2 Increasing knowledge base from systems courses Expected to develop problem list Saw certain problems enought to have a routine	#1 Coat-tailed primarily in all preceptorship No previous experience No knowledge of 'clinical' medicine Did not enjoy preceptorships Pace of practices--except one--too fast No training in physical diagnosis and differential diagnosis	#2 Not enough medical knowledge Not seen enough pathology Most patients follow-up-maintenance Different approaches by different clinicians Not enough emphasis on outside reading Systems course material out of sync with clinical cases
II	#3 2 Preceptorships where got to do a lot Systems knowledge #4 Saw a lot of patients with supervision Preceptor taught from scratch Lots of feedback Premedical experience	#5 Systems knowledge #6 Preceptor patiently taught Allowed to do a lot of gyn exams Findings checked by preceptor Systems courses provided useful information	#3 3 preceptorships just coat-tailed Preceptors didn't know student's level Insufficient knowledge of diseases Lack of practice with repetitive cases Pharmacology not practical #4 Systems courses out of sync with class cases Hadn't done enough or seen enough pathology Certain poor systems courses	#5 Hadn't done enough or seen enough pathology Systems approach not applicable to clinical practice #6 Little pathology Few patients worked on by self Unable to correlate theory with practice
III				
IV	#7 Previous experience/skills Had experience to bring to systems courses #8 Close supervision by preceptorship Premedical experience/knowledge	#9 Opportunities to work with patient on own Premedical experience/knowledge Preceptor spent time talking	#7 Lack of immediate evaluation and feedback Lack of realistic teaching in history taking #8 Still concentrating on the mechanics of skills Limited knowledge of diseases Lack of repetitive experience with part. problems Lack of knowledge of terminology, lab tests Lack of emphasis on PE skills in curriculum Forget what you don't use	#9 No thorough preparation in physical examination Lack of experience in certain procedures: pelvics Esoteric orientation of systems courses
V	#10 Previous experience/skills Got to practice OMT Systems knowledge broadened previously learned differentials #11 Systems biology knowledge Saw some patients alone		#10 Some poor medical practice role models Screened systems biology information according to own experiential notion what was important to general practice	#11 Certain incongruencies between systems biology approach and clinical presentation of patient Systems material out of sync with clinical presentations

EXHIBIT J

EXPLANATIONS FOR UNIT II
COMPETENCE IN DIAGNOSIS AND TREATMENT

Exhibit J

EXPLANATIONS FOR UNIT II COMPETENCE IN DIAGNOSIS AND TREATMENT

UNIT II CATEGORY	PROFICIENCY	DEFICIENCY
I	#1 CPSS gave you a way to think about problems & some therapeutics #2 Quality of the systems course Spent time "learning systems material If see it, remember it Some CPSS's helpful #3 See patient, go home & study/figure it out, go back & discuss it Spent a lot of time reading Some systems well done #4 Study in clinical medicine manuals Some courses include differential for systems CPSS, depending on leader, provides a way to think about problems	#1 Systems course (renal & resp) so short "Pimping" preceptor get in the way of thinking #2 Crammed for system test instead of to learn #3 Preceptor not teaching you how to think Ideological conflicts with faculty/material #4 Not seeing a good role model Easier to look up drugs than to memorize them Don't have differential diagnosis course Systems lecturers don't let you see inside their heads Delay in applying system knowledge
II	#5 Cumulative knowledge of systems Study disease after encounter it If see it - remember it Assertive in soliciting clinical information Recency of systems course Personal accountability (assignment) #6 Had a role model Jones' CPSS use student thought process #7 Preceptor "talked out loud" to patient & me #8 Prior experience in dealing with Gyn problems Chronic patients know all the questions & answers	#5 Didn't try to learn drugs & treatment No opportunity to follow up patient Intimidation tactics of CPSS faculty #6 Lack of problem-solving structure of system Just learned minutae to spit back Lack of knowledge of disease processes and variations they take No feedback on FM case write-ups Lack of confidence in knowledge base Common disorders not present in systems #7 Confusion of program about its own goals #8 Have only had 3 systems Too concerned about patient to take time needed to really work up case
III		
IV	#9 Have worked up cases in all systems but neurology Made effort to learn treatment of choice for common problems Have developed clinical case book for reference Repetition of cases increases memory Some systems do good job presenting management & treatment	#9 Have not worked up cases in neurology Docs don't use method I would use (textbook) Don't have time in preceptor office to look things up Docs don't use non-drug therapeutic modalities Didn't get any Peds in Peds too short Don't remember any OB
V	#10 Asserted myself - started problem solving in my head Learned enough to be aware of subtle clues Disorders in certain systems (G-U respiratory) tend to present in classical way #11 Keep clinical case notbook/journal of treatments Have enough clinical knowledge and experience to focus on differential Can recognize abnormalities Preceptor reschedules patient so can evaluate diagnostic decisions Have sought increasing independence and responsibility	#10 Haven't worked up cases as mental exercise Have a tendency to be passive Problem solving process not outlined until last term of Unit II Value of CPSS depends on instructor Neurology coordinator didn't do a very good job Systems course focus on exotica #11 Can't trust book knowledge until clinical case confirms it CPSS don't give "grey" cases CPSS don't deal with person, just disorder Was not my intent to learn all the details presented in systems

EXHIBIT K

EXPLANATIONS FOR UNIT III COMPETENCE

Exhibit K

EXPLANATIONS FOR UNIT III COMPETENCE

UNIT III CATEGORY	PROFICIENCY	DEFICIENCY
I	#1 4 or 5 time house staff go over findings House staff tell you what you need to know Sub-specialty rotations provided focus for study 2 M.D. institutions provided good teaching Attendings, house staff or peers discuss problem solving Experience with case - repetition #2 Rely on Unit II didactics Repetition of clinical cases Good teaching at DOH Reference book "Primary Care Physician" outlined what to do for G.P. office	#1 No physical exam course No differential diagnosis course Exam process doesn't require that you think Never got good feedback on H/P Had done 4 or 5 H/P before starting Unit III No orientatin to hospital, procedures, goals Not allowed to do certain things as clerk If I don't see it, I don't understand it Lectures not congruent with service on No interest in G.P. medicine #2 Differences in approach by clinicians No emphasis on self-teaching/reading in Unit II Teaching at too high level for clerk
II	#3 Experience doing consults-responsibility Work from Unit II info Intern outlined quick ER differential diag. Repetition with problem Responsibility for working up case Teaching self around a case #4 Good teaching on service Experience and teaching/learning congruent Responsibility for work-up & follow through with patient Teaching/feedback from sub-specialists Pre-medical knowledge Repetitive experience #5 Lots of hands-on exper. Helpful, pleasant staff Confidence Teacher/role model for structuring diff. diagnosis Concern/appreciation shown for clerk Spent time studying charts Self-study #6 Good teaching service: ask basic questions, show how to do proc., make student work-up patient Physician has clear protocol	#3 Insufficient patient base #4 No quality control in hospital Not good role models No reinforcement Not good feedback Too much scut work; little teaching Didactics not congruent with experience Lack of clinical relevance in basic science teaching Insufficient patient base Jr. Partner too soon in III #5 Teaching at too high a level for clerk Academic perspective (clerks) not congruent with reality of empirical nature of clinical medicine H/P not related to clerks learning No feedback on findings of H/P Lack of educational overview of hospital Lack of training in diff. diagnosis at MSUCOM #6 No teaching No hand-on experience Intern doesn't know or wants experience himself Lectures without concurrent experience Level of lectures beyond experience Lack of reinforcement of OMT & osteopathic principles
III		
IV	#7 Pre-medical experience Extensive, varied clinical experience (elective) Aggressive learner - took on patient resonsibility Assigned specific patient H/P & follow-up Good teaching with requirements of learning accountability Attendings interested in teaching Hands on experience Have self-confidence #8 Assigned patient responsibility Teaching around clerk's management of cases Clerk interested in taking responsibility Premedical knowledge/skills Sharing/verbalizing with peers/colleagues - learning environment #9 Good teaching on service responsibility given to clerk feedback, immediate remediation Good role model Sufficient pathology in pt. base Hands-on experience	#7 Cardiology too soon in rotation No patient responsibility Disinterest in area (psych) #8 Too many student for patient base No role for student No clinical teaching Not allowed to do things capable of No clinical differential diag. course at MSUCOM Curriculum deficient in certain info (antibiotics) No responsibility for patient #9 No teaching No responsibility assigned to learning role No help offered by house staff Basics not taught on service No clear specific learning objectives Weak preparation by MSUCOM
V	#10 Got to do things at own level-challenged Extensive pre-medical experience Responsibility for patient care/ work-up Held accountable for knowledge A lot expected of clerk Clerks taught each other Organized lectures/demonstration Aggressive learner Learning dependent on doing #11 Supervisor verbalized Positive reinforcement encouraged confidence Repetion of experience Good teaching Feedback on performance Role models Responsibility following modeling & teaching Initially lots of hand-holding in teaching Pre-medical training/experience Generally calm personality Intellectual framework provided before clerkship experience Confident	#10 No supervision - teaching Not challanged Lack of interest in area #11 Lack of opportunity for hands-on experience Lack of info in MSUCOM curriculum - specific clinical info Didn't have sub-specialty rotation Lack of training/experience

EXHIBIT L

NATURE OF LEAST/MOST PRODUCTIVE EXTERNSHIP ROTATIONS

Exhibit L

NATURE OF MOST/LEAST PRODUCTIVE EXTERNSHIP ROTATIONS

UNIT III CATEGORY	MOST		LEAST	
I	#1 No best or worst-accumulative experiences Took year to get baseline competence (extended) Jr. Partner excellent-got to manage patients had to make decisions	#2 Medicine: basis of practice; questioned repeatedly about important diagnostic (e.g.) issues	#1 No worst - just poorly prepared for Unit III	#2 Hematology: lectures and discussions geared to residents on service
II	#3 Infectious disease: end of program, given responsibility, do consults G.I./Medicine: first ½ of Unit III, given responsibility #4 Psychiatry (H. Ford Hosp) one-on-one with resident, academic, lecture immediately followed by case work-up, "continuity," "reinforcement" Pulmonary Medicine OB/Gyn	#5 OB: lots of hands-on experience, ward people helpful accepting, "felt competent" G.I.: academic, structured differentials, lots of feedback #6 Pulmonary: good teaching, encouraged & taught to do procedures, lead through problem solving	#3 Nephrology: too many people on service for patient load #4 Jr. Partnership: wasted because it was first, Peds (Riverside): good physician, but "no" patients Medicine: no teaching	#5 Psychiatry (MOMC) good lectures, no patient contact #6 Surgery: no teaching in surgery theater or in pre- or post-op, long, wasted hours in surgery
III				
IV	#7 All except psychiatry at Riverside: follow specific patients-consults-feedback #8 Medicine: most structured, "lots of responsibility get feedback, educational excellence of hospital is in medicine, I was interested in taking responsibility	#9 ER: physician really interested in teaching, immediate feedback/ repetition, everyone trying to help Psychiatry: attached to excellent resident who practiced "medicine" had patient care role presented cases	#7 Psychiatry: MOMC good lecture, no real patient contact Surgery-post-op: residents always gone #8 Psychiatry: too many students, no student role/responsibility, nobody wanted to teach, saw no patients, real good lectures Radiology: no one to teach Jr. Partnership: not allowed responsibility, new practice, difference in G.P./Hosp. philosophy	#9 Medicine: Botsford: shifted from within service to accomodate physician, physician too busy to teach, not guided through basics, attached to "bad" intern (attendings & res. did not like) told to "read about it"
V	#10 OB: decided about long-range goals, got to do a lot - more than most clerks	#11 Surgery: first rotation, got me started in learning to be efficient G.I. - "rewarding" toward end of clerkship more experienced/ knowledgeable, got to do consults, teaching going on, good feedback given, felt I was doing a good job	#10 One part of medicine rotation: no interns or residents, attending not interested in practice, not much pathology, no teaching	#11 OB: not much opportunity for actual "doing" H/P not integrated

EXHIBIT M

EFFECT OF KNOWLEDGE AND EXPERIENCE ON PROFESSIONAL COMPETENCE

Exhibit M

EFFECT OF KNOWLEDGE AND EXPERIENCE ON PROFESSIONAL COMPETENCE

UNIT II

	EFFECT OF SYSTEMS COURSE FIRST				EFFECT OF PRACTICE FIRST			
I	#1 Have differential to work from Key on major signs Few tentative working diagnoses Basic pharmacology to work from Can problem solve efficiently	#2 Current knowledge dominates thinking Key on major signs Have differential to work from Have criteria for disorders Know information source Understand pathology of disorder	#3 Provides flow chart for signs & symptoms Provides criteria for signs Have lab tests assigned to problem list Have systematic process for investigating system Anatomy course gives clues even if haven't had systems course Provides vocabulary Can "look" better	#4 Provides "small change" Have knowledge but no weights on any of it (Zebras v. common)	#1 Have to ask physician Can't talk "clinical language"	#2 Was real embarassed Haven't faintest idea what it is -	#3 Fear! Have to ask what every word means	#4 Follow protocol for data collection and then go ask
					Conjure up mental image of clinical case for system Provides marker for what didn't know Remember system knowledge better	Conger up mental image of clinical case for system Learning more affective/efficient in systems Image is code to memory	Conger up visual picture Remember what I read better if I see it first	Mental image becomes trigger Conjure up image of person representing case Build permutations around <u>the</u> case
II	#5 Get differential Key questions for system review provided Makes me "comfortable" - more assertive learning	#6 Learn and forget Learn specific info about disease, but not learn approach to problem solving	#7 Remember general things - pathophys. Certain skills - read EKG Get basic treatments Clinical work-ups for certain systems	#8 Provides base for asking preceptor questions - est. empirical weights on theoretical knowledge Provides key to major signs	#5 It was very tense - on the ragged edge of making fool of myself Ask Preceptor Feel inadequate am uncomfortable	#6 Don't recognize signs Have no basis for understanding explanation	#7 Impossible to confront clinical case first Have absolutely no idea	#8 Get alot more feedback Read before going in to see patient Basically lost! Look up everything Am slow!
					Provides reason for learning	Basis for learning or re-learning Person-case-provides reason and basis for learning approach to diff. diagnosis	Flash back - see patient Case essential to learning problem - solving approach	Can conjure up patient image Have clinical notes taken - treatment, questions Motivation for learning in systems Help remember stuff Make learning easier when have clinical language
III								
IV	#9 Feel more comfortable with clinical situation Have basic info about what to look for and how to rule out things Learn references				#9 Feel really uncomfortable Don't know efficient resources			
					Once you've seen a case, it sticks in your mind			
V	#10 I remember what was said when I encounter patient		#11 Systems courses haven't integrated the parts Integration depends on the preceptor or doing it on your own Know what H/P answers mean Know what questions mean and what they lead to		#10		#11 Feel stupid Can't do anything with data of H/P	
					I remember patient & relate what is said Visual stimulus is powerful		Can conjure up mental image	

EXHIBIT N

EXPLANATIONS FOR UNIT II INTEGRATION OF THEORY AND PRACTICE

Exhibit H

EXPLANATIONS OF UNIT II INTEGRATION OF THEORY AND PRACTICE

UNIT II CATEGORY				
I	#1 Gaps between systems information & what needed to cope with real problem Use background in physiology to understand real problem and medicine Try to think holistically Systems course gives differential Study on own after see case Clinical practice reinforces theory Clinical practice makes learning more efficient and effective	#2 Look for and do things currently studying Forget the little things when time gap between system and practice Built a reference book as go along Study clinical texts after seeing case Clincal practice makes learning more efficient and effective	#3 Look for things in patient that had in systems Read at home after seeing case Afterward "put it together" with preceptor The systems are interrelated in body Basic science (anatomy) allows fundamental screening of symptoms & signs	#4 Learn theory, see clinical case, and then read it again Experineces provides anchor for knowledge Someone has to help put T & P together ("has to be triggered") Need model of thinking (CPSS does that)
II	#5 Cumulatively understand the inter-relatedness of systems Look up things in notes after see case Experience becomes anchor for knowledge and "reason" for knowing Follow-up on patient helps understand, evaluate decision making Discussing case work up, etc. helps memory	#6 Some things are correlated in class lecture Integration mostly done by researching the topic <u>after</u> see the case Read in basic science text as well as clinical (Harrison's) text about case. Preceptor offers approach to thinking/patient solving Knowledge is cumulative Pediatrics could be integrator	#7 Re-read, after clinical case Until have seen it, it really isn't there Flash back - either knowledge or image or patient - to integrate what seeing or hearing about Read clinical text to re-learn things put it together for clinical use Problem solving approach <u>is</u> integration & gets developed <u>after</u> seeing cl. case being handled by someone (model) Comes from seeing, reading & talking through	#8 Study things about case after seeing it Have created a clinical note book of cases
III				
IV	#9 Have done a lot of outside reading--using clinical outline references that focus on differential diagnosis Read up on cases after I see them Seeing case is necessary to remembering and organizing clinical approach		#11 Have extended knowledge of pre-COM experience in ER Have developed "flow chart" for differential diagnosis, based on T. from systems course and experience Need clinical case to integrate knowledge	
V	#10 Use the Netter series to provide visual stimulus to learning theories When encounter patient, then study clinical reference Integration comes after both T & P have occurred Will ask preceptor what he thinks about theory presented in systems, re a particualr patient			

EXHIBIT O

ASSOCIATIONS OF EXPLANATIONS FOR UNIT II H/P COMPETENCE
OFFERED BY UNIT II SUBJECTS

EXPLANATIONS FOR UNIT II H/P COMPETENCE
OFFERED BY UNIT II SUBJECTS

(A) Got to do alot

(B) Lots of cases/pathology

(C) Was assertive/ self confident

(D) Had self-teaching goals

(E) Was taught "tricks of trade"

(F) Got positive reinforcement

(G) Was honest about own skills

(H) Was given critical feedback

(I) Have personal support system

(J) Supervisor had high expectations

(K) Had requisite knowledge base

(L) Was in non-threatening learning environment

(M) Was given responsibility

(N) Pre-MSUCOM experience and training

ASSOCIATION OF EXPLANATIONS FOR UNIT II H/P COMPETENCE OFFERED BY UNIT II SUBJECTS

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
A	-	.22	.60	.52	.37	.45	.30	.37	.07	.07	.52	.07	.22	.22
B	**.27**	-	.20	.17	.12	.15	.10	.12	.02	.02	.17	.02	.07	.07
C	**.64**	**.27**	-	.47	.33	.40	.26	.33	.065	.065	.47	.065	.20	.20
D	**.55**	**.27**	**.64**	-	.29	.35	.23	.29	.06	.06	.41	.06	.17	.17
E	.36	.00	.27	.18	-	.25	.16	.20	.04	.04	.29	.04	.12	.12
F	.36	.09	**.45**	**.36**	**.36**	-	.20	.25	.05	.05	.35	.05	.15	.15
G	**.45**	.00	**.27**	**.27**	**.27**	**.27**	-	.16	.03	.03	.23	.03	.10	.10
H	.27	.09	.27	.27	**.27**	**.36**	.09	-	.04	.04	.29	.04	.12	.12
I	.00	.00	**.09**	**.09**	**.09**	**.09**	**.09**	**.09**	-	.008	.06	.008	.02	.02
J	**.09**	.00	**.09**	.00	**.09**	**.09**	.00	.00	.00	-	.06	.008	.02	.02
K	**.55**	**.18**	.36	.27	.27	**.36**	.09	**.36**	.00	**.09**	-	.06	.17	.17
L	**.09**	.00	.00	.00	**.09**	**.09**	**.09**	**.09**	.00	100	**.09**	-	.02	.02
M	.27	**.18**	**.27**	**.27**	.00	.00	.09	.09	.00	.00	.09	.00	-	.07
N	.18	.00	.18	**.18**	.00	.09	.09	.09	.00	.00	**.18**	.00	**.09**	-

EXHIBIT P

ASSOCIATIONS OF EXPLANATIONS FOR UNIT II COMPETENCE OFFERED BY UNIT III SUBJECTS

EXPLANATIONS FOR UNIT II COMPETENCE
OFFERED BY UNIT III SUBJECTS

(A) Observed/worked with lots of those cases

(B) Got to do/practice a lot

(C) Had the requisite knowledge

(D) Supervisor had high expectations

(E) Was taught "tricks of trade"

(F) Was given feedback and findings checked

(G) Supervisor had protocol for types of cases

(H) Pre-MSU-COM experience and training

ASSOCIATIONS OF EXPLANATIONS FOR UNIT II COMPETENCE
OFFERED BY UNIT III SUBJECTS

	A	B	C	D	E	F	G	H
A	-	.25	.35	.05	.10	.20	.05	.20
B	**.27**	-	.29	.04	.08	.16	.04	.16
C	**.36**	**.36**	-	.06	.115	.23	.06	.23
D	**.09**	**.09**	**.09**	-	.016	.03	.008	.03
E	.09	**.18**	**.18**	.00	-	.06	.016	.06
F	.18	**.27**	.18	.00	**.18**	-	.03	.13
G	.00	**.09**	**.09**	.00	**.09**	**.09**	-	.03
H	.18	.09	.09	.00	.00	**.18**	.00	-

EXHBIT Q

ASSOCIATIONS OF EXPLANATIONS FOR UNIT II DEFICIENCIES
OFFERENCED BY UNIT II SUBJECTS

EXPLANATIONS FOR UNIT II H/P DEFICIENCIES OFFERED BY UNIT II SUBJECTS

(A) Little pathology in available cases

(B) No repetition or practice

(C) No patient follow-up

(D) Don't have requisite knowledge

(E) Psychological stress/intimidation

(F) Too few patients in practice

(G) No personal interest

(H) Not encouraged to do

(I) No feedback from clinical instructor

(J) Hesitancy/lack of assertiveness

(K) Didn't know standards/expectations

(L) Poor MSU-COM training

ASSOCIATIONS OF EXPLANATIONS FOR UNIT II DEFICIENCIES
OFFERED BY UNIT II SUBJECTS

	A	B	C	D	E	F	G	H	I	J	K	L
A	-	.33	.04	.16	.20	.04	.20	.04	.04	.12	.04	.08
B	.27	-	.065	.26	.33	.065	.24	.065	.065	.20	.065	.13
C	.09	.09	-	.03	.04	.008	.04	.008	.008	.02	.008	.016
D	.27	.27	.09	-	.16	.03	.16	.03	.03	.10	.03	.06
E	.18	.36	.09	.27	-	.04	.20	.04	.04	.12	.04	.08
F	.00	.09	.00	.00	.09	-	.04	.008	.008	.02	.008	.016
G	.09	.27	.00	.18	.09	.00	-	.04	.04	.12	.04	.08
H	.00	.09	.00	.09	.09	.00	.09	-	.008	.02	.008	.016
I	.00	.09	.00	.00	.09	.00	.00	.00	-	.02	.008	.016
J	.18	.18	.00	.09	.00	.00	.18	.00	.00	-	.02	.05
K	.09	.09	.00	.09	.09	.00	.00	.00	.00	.00	-	.016
L	.09	.09	.00	.09	.09	.00	.09	.00	.00	.00	.09	-

EXHIBIT R

ASSOCIATIONS OF EXPLANATIONS FOR UNIT II
DIAGNOSTIC AND MANAGEMENT COMPETENCE
OFFERED BY UNIT II STUDENTS

EXPLANATIONS FOR UNIT II DIAGNOSTIC AND MANAGEMENT COMPETENCE OFFERED BY UNIT II STUDENTS

(A) Some CPSS' gave problems solving strategy

(B) Some CPSS' gave therapeutics

(C) Quality of some systems courses

(D) Personal effort to learn

(E) Seeing patient/case increases memory

(F) Use clinical medicine manual

(G) Cumulative knowledge of systems courses

(H) Assertiveness in clinical setting

(I) Recency of pertinent systems course

(J) Good clinical role model

(K) Pre-MSU-COM training/experience

(L) Help from patients with chronic illness

(M) Worked up cases in system

(N) Developed personal clinical notebook

(O) Repetition of clinical cases increases memory

(P) Can recognize abnormalities

(Q) Patient follow-up provided

ASSOCIATIONS OF EXPLANATIONS FOR UNIT II DIAGNOSTIC
AND MANAGEMENT COMPETENCE OFFERED BY UNIT II STUDENTS

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
A	-	.06	.13	.19	.13	.03	.06	.13	.03	.06	.06	.03	.06	.06	.03	.03	.03
B	.18	-	.06	.10	.06	.016	.03	.03	.016	.03	.03	.016	.03	.03	.016	.016	.016
C	.18	.09	-	.19	.13	.03	.06	.13	.03	.06	.06	.03	.06	.06	.03	.03	.03
D	.18	.09	.36	-	.19	.05	.10	.10	.05	.10	.10	.05	.10	.10	.05	.05	.05
E	.09	.09	.09	.36	-	.03	.06	.06	.03	.06	.06	.03	.06	.06	.03	.03	.03
F	.09	0	.09	0	0	-	.016	.016	.008	.016	.016	.008	.016	.016	.008	.008	.008
G	0	0	.09	.09	0	0	-	.03	.016	.03	.03	.016	.03	.03	.016	.016	.016
H	0	0	.09	.09	0	0	.18	-	.016	.03	.03	.016	.03	.03	.016	.016	.016
I	0	0	.09	.09	0	0	.09	.09	-	.016	.016	.008	.016	.016	.008	.008	.008
J	.09	0	0	0	0	0	0	0	0	-	.03	.016	.03	.03	.016	.016	.016
K	0	0	0	0	0	0	.09	.09	0	0	-	.016	.03	.03	.016	.016	.016
L	0	0	0	0	0	0	0	0	0	0	.09	-	.016	.016	.008	.008	.008
M	0	0	.18	0	0	0	0	0	0	0	0	0	-	.03	.016	.016	.016
N	0	0	.09	.18	0	0	.09	.09	0	0	.09	0	.09	-	.016	.016	.016
O	0	0	.09	.09	0	0	0	0	0	0	0	0	0	.09	-	.008	.008
P	0	0	.09	0	0	0	.09	.09	0	0	.09	0	0	.09	0	-	.008
Q	0	0	0	0	0	0	.09	.09	0	0	.09	0	0	.09	0	.09	-

EXHIBIT S

ASSOCIATIONS OF EXPLANATIONS FOR UNIT II DEFICIENCIES
IN DIAGNOSTIC AND MANAGEMENT COMPETENCE OFFERED BY UNIT II SUBJECTS

ASSOCIATIONS OF EXPLANATIONS FOR UNIT II DEFICIEINCIES IN DIAGNOSTIC AND MANAGEMENT COMPETENCE OFFERED BY UNIT II SUBJECTS

(A) Inadequate systems courses (short or poorly coordinated)

(B) Unconstructive clinical instructional techniques

(C) Crammed systems information instead of learn

(D) Not taught to problem solve

(E) Ideologic conflicts with instructor or information

(F) No good clinical role model

(G) Delay in applying systems information

(H) Easier to look up drugs than memorize

(I) No patient follow-up

(J) Lack of knowledge of diseases/processes

(K) No feedback on case write-ups

(L) Lack confidence in knowledge

(M) Common disorders not presented in systems courses

(N) Program's confusion about its goals

(O) Finished preceptorships having only 3 systems course

(P) Fast pace of preceptor's practice

(Q) Not having worked up cases in system

(R) Passive in clinical situation

(S) Quality of CPSS courses variable

(T) Selective learning

ASSOCIATIONS OF EXPLANATIONS FOR UNIT II
DEFICIENCIES IN DIAGNOSTIC AND MANAGEMENT COMPETENCE
OFFERED BY UNIT II SUBJECTS

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
A	-	.05	.05	.12	.02	.02	.02	.05	.02	.02	.02	.02	.05	.02	.02	.05	.07	.02	.05	.07
B	.09	-	.03	.08	.016	.016	.016	.03	.016	.016	.016	.016	.03	.016	.016	.03	.05	.016	.03	.05
C	0	0	-	.08	.016	.016	.016	.03	.016	.016	.016	.016	.03	.016	.016	.03	.05	.016	.03	.05
D	.18	0	.09	-	.04	.04	.04	.08	.04	.04	.04	.04	.08	.04	.04	.08	.12	.04	.08	.12
E	0	0	0	.09	-	.008	.008	.016	.008	.008	.008	.008	.016	.008	.008	.016	.02	.008	.016	.02
F	0	0	0	.09	0	-	.008	.016	.008	.008	.008	.008	.016	.008	.008	.016	.02	.008	.016	.02
G	0	0	0	.09	0	.09	-	.016	.008	.008	.008	.008	.016	.008	.008	.016	.02	.008	.016	.02
H	0	.09	0	.09	0	.09	.09	-	.016	.016	.016	.016	.03	.016	.016	.03	.05	.016	.03	.05
I	0	.09	0	.09	0	0	0	.09	-	.008	.008	.008	.016	.008	.008	.016	.02	.008	.016	.02
J	0	0	.09	.09	0	0	0	0	0	-	.008	.008	.016	.008	.008	.016	.02	.008	.016	.02
K	0	0	.09	.09	0	0	0	0	0	.09	-	.008	.016	.008	.008	.016	.02	.008	.016	.02
L	0	0	.09	.09	0	0	0	0	0	.09	.09	-	.016	.008	.008	.016	.02	.008	.016	.02
M	.09	0	.09	.18	0		0	0	0	0	.09	.09	.09	-	.016	.016	.03	.05	.016	.03
N	0	0	0	0	0	0	0	0	0	0	0	0	0	-	.008	.016	.02	.008	.016	.02
O	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	.016	.02	.008	.016	.02
P	0	0	0	.09	0	0	0	0	0	0	0	0	0	0	.09	-	.05	.016	.03	.05
Q	.09	0	0	.18	0	0	0	0	0	0	0	0	.09	0	0	.09	-	.02	.05	.07
R	.09	0	0	.09	0	0	0	0	0	0	0	0	.09	0	0	0	.09	-	.03	.05
S	.09	0	0	.09	0	0	0	0	0	0	0	0	.09	0	0	0	.18	.09	-	.07
T	0	0	0	.09	0	.09	.09	.18	.09	0	0	0	0	0	0	0	.09	0	.09	-

EXHIBIT T

ASSOCIATIONS OF EXPLANATIONS FOR UNIT III COMPETENCE
OFFERED BY UNIT III SUBJECTS

EXPLANATIONS FOR UNIT III COMPETENCE OFFERED BY UNIT III SUBJECTS

(A) Staff checked findings/immediate feedback

(B) House staff tell you what you need to know

(C) Indepth knowledge from sub-specialty rotations

(D) M.D. institutions had good teaching

(E) Staff discuss problem solving process

(F) Repetition with type of case

(G) Rely on Unit II didactics

(H) Good teaching on rotation at base hospital

(I) Used clinical reference text

(J) Got to do consults

(K) Given patient care responsibility

(L) Took responsibility for learning

(M) Teaching congruent with patient responsibility

(N) Pre-MSU-COM knowledge

(O) Role modeling by staff

(P) Studied patient charts

(Q) Self-confident/assertive

(R) Staff has protocols for case management

(S) Had varied clinical experience/electives

(T) Staff interested in student's learning

(U) Student made accountable

(V) Sufficient pa[illegible]ogy

(W) Peer teaching and support

(X) Clerks organized lectures and demonstratic[illegible]

ASSOCIATIONS OF EXPLANATIONS FOR UNIT III COMPETENCE
OFFER BY UNIT III SUBJECTS

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
A	-	.12	.08	.04	.20	.29	.12	.24	.04	.24	.37	.16	.12	.24	.08	.04	.16	.04	.04	.16	.08	.04	.08	.04
B	.18	-	.05	.02	.12	.17	.07	.15	.02	.15	.22	.10	.07	.15	.05	.02	.10	.02	.02	.10	.05	.02	.05	.02
C	.18	.09	-	.016	.08	.12	.05	.10	.016	.10	.66	.06	.05	.10	.03	.016	.06	.016	.016	.06	.03	.016	.03	.016
D	.09	.09	.09	-	.04	.06	.02	.05	.008	.05	.15	.03	.02	.05	.016	.008	.03	.008	.008	.03	.016	.008	.016	.008
E	.18	.18	.09	.09	-	.29	.12	.24	.04	.24	.37	.16	.12	.24	.08	.04	.16	.04	.04	.16	.08	.04	.08	.04
F	.45	.27	.18	.09	.09	-	.17	.35	.06	.35	.52	.23	.17	.35	.12	.06	.23	.06	.06	.23	.12	.06	.12	.06
G	.09	.09	0	0	0	.27	-	.15	.02	.15	.22	.10	.07	.15	.05	.02	.10	.02	.02	.10	.05	.02	.05	.02
H	.27	0	.09	0	0	.36	.18	-	.05	.29	.44	.19	.15	.29	.10	.05	.19	.05	.05	.19	.10	.05	.10	.05
I	0	0	0	0	0	.09	.09	.09	-	.05	.07	.03	.02	.05	.016	.008	.03	.008	.008	.03	.016	.008	.016	.008
J	.18	.18	0	0	0	.27	.18	.27	0	-	.44	.19	.15	.29	.10	.05	.19	.05	.05	.19	.10	.05	.10	.05
K	.27	.18	.09	0	0	.36	.18	.45	0	.54	-	.29	.22	.44	.15	.07	.30	.07	.07	.30	.15	.07	.15	.07
L	.09	.18	0	0	0	.18	.09	0	0	.27	.36	-	.10	.19	.06	.03	.13	.03	.03	.13	.06	.03	.06	.03
M	.09	0	.09	0	0	.09	0	.09	0	.09	.36	.18	-	.15	.05	.02	.10	.02	.02	.10	.05	.02	.05	.02
N	.27	.09	.09	0	0	.27	.09	.27	0	.36	.54	.27	.27	-	.10	.05	.19	.05	.05	.19	.10	.05	.10	.05
O	.18	0	0	0	0	.18	.09	.18	0	.09	.18	0	0	.09	-	.016	.06	.016	.016	.06	.03	.016	.03	.016
P	.09	.09	0	0	0	.09	0	0	0	.09	.09	.09	0	.09	0	-	.03	.008	.008	.03	.016	.008	.016	.008
Q	.18	.09	0	0	0	.18	.09	.18	0	.36	.36	.18	.09	.36	.09	.09	-	.03	.03	.13	.06	.03	.06	.03
R	0	0	0	0	0	0	0	.09	0	.09	.09	0	0	0	0	0	0	-	.008	.03	.016	.008	.016	.008
S	0	0	0	0	0	0	0	.09	0	.09	.09	0	0	.09	0	0	.09	0	-	.03	.016	.008	.016	.016
T	.09	.09	0	0	0	.09	0	.09	0	.27	.36	.27	.18	.36	0	.09	.27	0	.09	-	.06	.03	.06	.03
U	0	0	0	0	0	0	0	.09	0	.18	.18	.09	.09	.18	0	0	.18	0	.09	.18	-	.016	.03	.016
V	.09	0	0	0	0	.09	0	.09	0	0	.09	0	0	0	.09	0	0	0	0	0	0	-	.016	.008
W	0	0	0	0	0	0	0	0	0	.09	.18	.18	.18	.18	0	0	.09	0	0	.18	.09	0	-	.016
X	0	0	0	0	0	0	0	0	0	.09	.09	.09	.09	.09	0	0	.09	0	0	.09	.09	0	.09	-

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