# INNOVATIONS IN BASIC SCIENCE TEACHING AND LEARNING

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## Integration in the Biomedical Science Curriculum

*Dr. Casale's article is the third in a series examining the integration of basic science concepts and clinical applications. She describes a new course, the Healthy Human, for first year medical students at the University of Kentucky College of Medicine that integrates development of professionalism, communication skills and clinical problem-solving experiences. In addition, students are introduced to preventive medicine concepts and the roles and values of community health resources. There is emphasis on fostering wholesome health behaviors in patients as well as recognizing the value of these for themselves. The Healthy Human course runs concurrently with the basic science courses during the first 14 weeks of the first year. It uses a small group, problem-based learning format and patient cases.*

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# Learning the Skills of a Physician: Professionalism, Compassion, and Problem-Solving

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## INTRODUCTION

Integration of educational components in the biomedical curriculum is the current theme for a series of articles in this column. Integration is especially relevant in blending the basic sciences with clinical medicine during the first years of undergraduate medical education. University of Kentucky College of Medicine (UKCOM) first year students participate in their first integration experiences during orientation week in an "Introduction to Professionalism" program which includes a "white coat" presentation ceremony. Integration is a recurring theme throughout the basic science and clinical curriculums at UKCOM. As a result, the physicians-in-training are repeatedly exposed to a practical format in which they learn and practice the skills necessary to effectively communicate with and treat patients and continue their medical education as life-long learners. Additionally, they learn to appreciate the importance of healthy personal behaviors and lifestyles in their patients and in their own lives. Following the orientation program, the process of developing attitudes which foster integration of basic science and medical practice, professionalism, compassion, ethics and other desirable personal traits continues during the first 14 weeks of the first year in a course titled "Healthy Human". This article discusses the goals, format and outcomes of this course.

## BACKGROUND

In 1992 the Robert Wood Johnson Foundation Commission report on medical education[1] proposed a "Mandate for Change." Conclusions of the Commission reflected growing concerns that medical education in the United States inadequately prepares medical students to meet the needs of patients and medical practice in our evolving society. Although the traditional large group didactic lecture format provides the latest scientific and technologic medical information, the development of professionalism and compassion in medical students is often left to chance.[2,3]

Haggerty and colleagues[2] concluded that clinical instruction of medical students, including patient contact and interviewing techniques, should begin as early as the first day of medical school. They specifically suggested that basic science, including behavioral science, should be incorporated throughout the medical cur-

riculum. It is a widely held opinion that an important outcome of a medical education is that physicians must develop life-long learning skills.[4] Furthermore, life-long learning skills develop best when introduced early and practiced throughout the medical curriculum.[4, 5]

The practice of medicine is experiencing remarkable evolutionary developments. For example, every year technological advances occur providing new and increasingly expensive techniques to diagnose and treat disease. Patients demand the most expensive medical care, while at the same time health insurers require efficiencies in medical management that will reduce cost but not compromise medical care. Medical cost reimbursement is increasingly monitored and controlled in both the public and private sectors. These trends will continue for the foreseeable future. Physicians will be required to make decisions that could conflict with how they perceive their patients' needs or with their personal or professional ethics and interests. The necessity for physicians to increase their knowledge base, control costs, maintain high standards and provide evidence of outcome-based quality improvement will continue unabated. The patient and his family, as well as ethical and professional principles may easily be lost among these conflicting considerations. Special communication skills and attitudes regarding patient well-being are needed to enable physicians to proficiently manage factors that impact on medical practice. Attitudes and skills learned early in undergraduate medical education are subsequently more likely to be applied in practice.[4]

In 1994, in response to these concerns, the University of Kentucky College of Medicine implemented curriculum changes that integrated behavioral science, basic science, and concepts related to patient communication using problem-based learning methods. Students model their professional behaviors and their interactions with patients on the behaviors and attitudes of physicians they observe in clinical situations. It is important that these role model physicians effectively demonstrate and reinforce attitudes of concern and respect for patients, their families and their communities. Consequently, it was logical to design a first year course, subsequently titled the "Healthy Human", using appropriate clinician role models to reinforce desirable behaviors. Furthermore, an early introduction to concepts regarding health maintenance, disease prevention and the use of community-based health resources was desired for its intrinsic value and also as a complement to the patient oriented format.

## GOALS OF THE HEALTHY HUMAN COURSE

The Healthy Human course was developed as one of the vehicles to provide first year students with role models and patient care-based exercises that facilitate achievement of the course objectives listed in Table 1.

**Table 1.** Objectives for the Healthy Human Course

- Demonstrate the integration of basic and clinical science.
- Develop professional and compassionate attitudes and behaviors.
- Develop problem-solving skills.
- Foster attitudes of life-long learning.
- Apply concepts of health maintenance and disease prevention.
- Access community-based health resources.

## DEVELOPING NEW TOOLS: LIFE-LONG LEARNING AND PROBLEM-SOLVING SKILLS

Providing students with the expertise to cope with the multifaceted nature of modern health care requires the development of problem-solving skills at every opportunity throughout the medical curriculum. The process of deductive reasoning must be introduced and practiced early and honed to a fine art throughout the years of undergraduate medical education. Problem-based learning methods are uniquely appropriate to address this need and were adopted for the Healthy Human course. The result is that students benefit from a curriculum that integrates didactic lectures with the Socratic method of learning.

## STRUCTURE OF THE HEALTHY HUMAN COURSE

Concurrent with the Healthy Human course, students attend traditional lecture and laboratory basic science courses. The Healthy Human course meets several times a week for the first fourteen weeks of the first year in small group sessions with a clinical faculty facilitator. During these sessions patient scenarios are presented as "paper cases". Data from the patient interview, examination and clinical lab are revealed in a format and sequence similar to an actual clinical setting. Students discuss and evaluate clinical data as revealed and formulate a next course of action (See patient case example below). Full discussion of a case may require several class sessions. All cases are based on actual patients evaluated and treated at UKCOM.

*The Healthy Human course provides students opportunities to relate basic science content and concepts to their ultimate goal of providing competent and compassionate care for patients.*

The Healthy Human course provides students opportunities to relate basic science content and concepts to their ultimate goal of providing competent and compassionate care for patients. The eight or nine students assigned to each group determine what "next steps" must be taken at each juncture in the patient's story. The facilitator provides guidance as students decide what additional information is necessary, which diagnoses to consider, which treatments to prescribe, what referrals to make, and which preventive behaviors or lifestyle choices might have averted this problem. The students prepare learning objective reports for each session and, in addition, may be required to draft appropriate letters to a consultant for referral or to the

patient's primary physician.

Thus, from the first day of medical school, students observe and practice the process of "thinking as a physician". They have the opportunity to practice the skill of organizing their thoughts to best obtain adequate patient histories, formulate differential diagnoses, order necessary diagnostic studies and prepare comprehensive care plans. During the problem-based learning sessions they are required to investigate and practice methods of communication that will effectively educate patients regarding their medical problems and health-compromising behaviors. In addition, they have opportunities to explore a variety of options for inexpensive or free patient assistance available in the community. Students identify available community services early in their medical training and are therefore more likely to incorporate community resources into treatment plans in their later practice. This format provides the additional benefit of developing communication skills through interactive dialogues and problem-solving during the small group sessions. The objective of faculty participation is to facilitate student discussion and guide the direction of problem solution rather than providing answers to students' learning objectives.

## APPLICATION OF A PATIENT CASE

*An 18-year-old female presents as a clinic patient with the complaints of nausea, weight gain and fatigue.*

Students collaborate to determine how to obtain an adequate history. As they formulate questions, the facilitator provides the answers that were actually given by the patient. The facilitator guides the students in formulating appropriate questions. A review of systems follows. Students are given a general outline to follow to obtain this information. Armed with this information the group determines which examination procedures and lab tests to order and what further information is needed. As the case unfolds during the session the facilitator reveals additional patient data.

*The patient normally has irregular menses, smokes a pack of cigarettes a day, drinks large quantities of beer and an occasional pint of whiskey on the weekends, and had a rash and fever that lasted a few days about 6 weeks before this visit. She is a high school drop-out who works in a fast food restaurant and lives in an inexpensive apartment close to work. However, she is extremely short on funds right now because she broke up with her live-in boy friend two weeks ago and now has to assume payment of the rent. She has not heard from him, but friends have told her that he has moved out of state. Her employer does not provide health insurance. She makes little more than minimum wage.*

The learning objectives formulated by the students during the first session are usually quite sophisticated and include pregnancy testing, normal lab values, contraception, HIV-testing, binge-drinking, tobacco abuse among teenagers, causes for rash with fever, causes of irregular menses and/or amenorrhea and Medicaid eligibility. Each student in the group selects one learning objective to prepare as a brief report using resources such as reference texts, current literature, and interviews with faculty or other knowledgeable people in community services. They present this information at the subsequent small group session and a round table discussion ensues. The next piece of the patient's story is then presented. The students learn the results of the tests they requested. Again they determine, with the guidance of the facilitator, what additional information should be obtained.

*Lab data confirm that the "patient" is pregnant and anemic.*

A discussion ensues regarding family dynamics, abortion vs. adoption vs. single parenting, the necessity for HIV testing in all pregnant women, community and governmental programs and services that might provide assistance in the coming months. The students identify the difficulty in discerning the patient's expected date of confinement. They recognize that a viral illness may have produced the rash. In addition, the patient's smoking and alcohol history evoke concern about fetal abnormalities and developmental delays. Usually this evokes a tentative exploration and discussion about how to counsel the patient regarding the developmental risks her fetus is experiencing.

By working with the parameters of a real life scenario students quickly realize the importance of developing a plan for patient education and assistance in addition to the technical aspects of medicine. They will choose the areas they want to investigate as more patient information is provided and another set of learning objectives is identified. The second session elicits objectives regarding the ethical considerations that arise when a physician and a patient have opposing attitudes regarding abortion, adoption, AIDS and other patient-physician interactions that might result in conflict. Students have the opportunity to discuss appropriate solutions to irreconcilable differences in prejudices, moral standards and social values. Other learning objectives become apparent including which fetal malformations can be detected *in utero*, how to provide nutritional counseling, dietary supplementation, and the need for supplemental folic acid for women during childbearing years. Lively discussions ensue at each session as the "patient" progresses over the next few weeks. The same procedure is repeated at each session until the case is completed and summarized. By the time students reach the conclusion of the case, they have had valuable experiences in patient management, patient-physician communication, collaborative medical management, verbal presentation, literature search and the preparation of concise written reports.

This format presents multiple opportunities for students to determine which community services might be available to provide beneficial resources for their "patient". Students are encouraged to contact these services as if they had a "real patient" to refer. Lists of contact resource persons who have agreed to "act as consultants" to students are provided with the "paper case" information packets. These "consultants" are faculty and staff of UKCOM and also individuals from the public and private sector organizations that can provide assistance to patients or the patients' family. A sample of these organizations in Kentucky include State Health and Human Services, the local Health Department, the local WIC (Women, Infants, Children) office, Employment Services, Church Organizations, YMCA (Young Men's Christian Association) or YWCA (Young Women's Chris-

tian Association), Salvation Army, Blood and Plasmapheresis Center, as well as local support groups such as Alcoholics Anonymous, Home for Unwed Mothers and Family Planning Centers.

## BENEFITS OF THE COURSE

The Healthy Human course is specifically designed to incorporate principles of preventive medicine and public health into the first year medical school curriculum. In addition, it provides the first opportunities to develop compassionate professional behavior, communication skills and problem-solving experience. Additionally, the course provides a vehicle to introduce concepts of epidemiology, immunization, travel medicine, occupational medicine, workman's compensation, changing patterns of health care delivery and health care access as well as the myriad types of health care cost disbursement methods. To assist the course, UKCOM has access to resources of the Department of Preventive Medicine, the Fayette County Department of Public Health, the Office of the State Commissioner for Health, and the Kentucky Department of Public Health.

An additional dividend of the Healthy Human Course is that it encourages students to incorporate healthy behaviors in their own lives. It is designed to relate life style choices and healthy behaviors not only to the student's eventual patient base but also to the students' own habits during the long years of medical education. Inviting the students to regard themselves as their own "first patient" brings the principles of healthy lifestyles into focus and allows for open discussions of nutrition, alcohol use, safe sex, the importance of exercise, and the benefits of spiritual and family support. Formulating solutions for their patients' unwholesome health behaviors prompts students to focus on the importance of formulating workable solutions for their own life styles. In this context, the importance of smoking cessation, alcohol in moderation, good nutrition, and exercise are discussed. In addition, the importance of recreation and healthy family interaction is stressed as students identify feasible solutions for their patients. The Healthy Human course demonstrates to first year students the interface between the science of medicine and the interpersonal aspects of the physician-patient interaction. Using the problem-based learning approach, students can relate preventive medicine and wellness concepts to their own habits and life style.

*Students identify available community services early in their medical training and are therefore more likely to incorporate community resources into treatment plans in their later practice.*

Other benefits include:

- Developing the ability to evaluate the validity of data presented in journal articles and clinical study designs
- Learning good medical writing techniques, including reports and letters of referral
- Obtaining an introduction to the concepts of comprehensive patient care
- Accepting the importance of continuing medical education
- Recognizing the importance of preventive medicine, wellness behavior, and public health services

## COMMENT

Problem-based learning is an extremely effective method of teaching life-long learning skills, and colleges of Nursing, Dentistry and Medicine worldwide are incorporating this technique into their curriculums. A recent study done in Linkoping University in Sweden revealed that students who have used problem-based learning methods acquired at least the equivalent scientific knowledge base as students in a conventional medical curriculum.[6] Another report from the University of Ottawa concluded that problem-based learning resulted in measurable positive outcomes such as increased motivation for learning and developing skills in clinical reasoning and structuring knowledge in clinical contexts.[7]

A survey of recent graduates at the University of Wisconsin asked which components they believed made important contributions to their medical education. The most common responses were to enhance the clinical orientation of the first two years of medical education. Students in this group asserted that the highest priorities for receiving resources should be the coordination of the basic and clinical sciences throughout the medical curriculum, problem-based learning experiences and preserving teaching efforts throughout the third and fourth years.[8]

A cooperative study done by the Medical University of South Carolina College of Medicine and the University of Texas Medical Branch at Galveston compared students' perceptions of their learning environments. The problem-based learning curriculums at these schools are almost identical with respect to student selection and curricular organization and implementation. Results showed that students involved with problem-based learning experiences were more satisfied with their learning environment than students in the lecture/lab-based curriculum. In addition, the study supported the conclusions that this increased satisfaction was a direct effect of the problem-based learning in the curriculum.[9]

There is accumulating evidence that the Healthy Human course and insertion of problem-based learning experiences in the first year of the UKCOM curriculum have increased effectiveness of the educational program. The USMLE Step 1 scores are at or above the national averages. The specific impact of the "Professionalism" component is presently being assessed.

The patient's optimal health and comfort should be the first concern and ultimate goal of physicians. In that regard, integration of basic science concepts, clinical reasoning skills combined with professional attitudes and life-long learning are essential to attaining this goal. The introduction of courses with the objectives of the Healthy Human course early in medical education optimizes medical students' opportunities to develop and practice these skills throughout their professional lives.

## CONCLUSIONS

The Healthy Human course, a component of the first curriculum block at UKCOM, utilizes problem-based learning methods to facilitate development of communication skills, and the professional and compassionate attitudes expected in physician-patient interactions. "Paper cases" describing actual patients are used as stimuli for small group discussions and problem-based learning sessions. Learning objectives are developed and subsequently presented by students as elements of the patient's problem are revealed. Basic science concepts and content related to the patient case are integrated, reviewed and extended. Students develop clinical reasoning and problem-solving skills as they evaluate clinical data and formulate courses of action. Students are guided to consider recommendations regarding health maintenance, disease prevention and access to community-based health resources.

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