Improving medical physiology education: outlook for the 1990s

In the past year, as my growing interest in physiology education encountered the realities of the “soft money” environment in which I lived, I was afforded the opportunity to broaden my perspective from that of faculty member focused on a single institution to that of consultant concerned with issues common to many institutions. As a result of this transition, I became more aware of a number of questions concerning how we approach physiology in the medical school curriculum. These are not necessarily new questions, nor are they unique to physiology. However, if we are to make significant progress in medical physiology education in the 1990s, the physiology community must, in my view, actively address these issues in a meaningful way. I will, therefore, discuss each of these issues briefly in the hope that a dialogue will ensue that may lead to improved physiology education.

What Should a Medical Physiology Course Include?

Faculty in discipline-oriented curricula charged with developing or updating their medical physiology course are faced with an increasing challenge. As “cutting edge” research moves more toward the subcellular and molecular levels, they must decide whether more class time should be devoted to recent findings at the subcellular and molecular levels. This, of course, reduces the time available for focusing on the integrative and systemic aspects of physiology. Most physiologists would agree that the “minimum knowledge base” to which medical students should be exposed continues to grow, but curriculum hours devoted to presenting this knowledge base continues to shrink. Apparently, there is no satisfactory solution to this dilemma—or is there?

The first question that most faculty ask when deciding what content should be included is, “What should the students know at the end of the course?” That is, the faculty assume that the curriculum should be designed with knowledge-based learning in mind. To “know” something in this context seems to mean to be able to recall information with which to answer multiple-choice examination questions that do not require more than one or two reasoning steps. Topics are then chosen, and the limited schedule is filled with activities designed to present the “necessary” information within the chosen topics.

Perhaps a more appropriate approach is to design the curriculum around skill-based learning, in which case the first question is, “What should the students be able to do with physiological information at the end of the course?” Certainly, the goal is not to simply regurgitate the terminology, the students should be able to solve physiological problems. If, indeed, this is the goal of the course, the content question becomes, “What content is necessary to help the students learn this skill?” With this approach, it is not necessary to present the entire body of physiological information within the time constraints of the physiology curriculum. Instead, course activities are directed toward achieving the course goal. As part of this process, students should certainly be made aware of how to access pertinent physiological information so that they can continue to build on the foundation established in the formal course. Additional opportunities should also be made available throughout their medical training to reinforce the role of physiology and physiological problem solving in clinical medicine.

What is the Faculty’s Role in the Educational Process?

The next issue that must be addressed is the role of faculty in the educational process. If most physiology faculty reflect on their teaching activities, they will discover that, to a large extent, their role has been to disseminate information. In fact, one of the arguments presented for retaining the lecture format is that a great deal of information can be presented in a relatively short period of time. In most cases, however, the students are given the same information in other formats (e.g., textbooks, syllabi, etc.). Is our role to be an oral textbook, or is our role to help the learner to learn? If the goal of the course is to help students acquire certain skills, I submit that our role is to help the learner to learn. This entails designing activities in which students can practice reasoning skills that will help them solve physiological problems. Furthermore, if we are to do the best job we can, we should continue in this role throughout the student’s medical training.

The common responses to this role definition evokes are that 1) the student-faculty ratio and the limitations of the calendar and physical plant do not allow us to approach our course in this way and 2) the students will rebel. Students want to be “spoon-fed” and, above all else, be told what will be on the exam. My answer to the first response is that the space and time limitations can be overcome with a little creative thinking. The technology currently available for use in the classroom can supply us with a wide variety of vehicles with which to help students learn how to solve physiological problems.

My answer to the second response is that students respond to the ground rules laid down for a particular course. If they are told, implicitly or explicitly, that lectures will present all the information they need to know, and all the information is not presented, they will “rebel.”
On the other hand, if they are told that the course will require them to do some independent study for primary instruction, they will perform accordingly. The key is to identify the course objectives clearly and ensure that class activities are consistent with those objectives.

How Should We Evaluate Our Teaching Efforts?

It is reassuring to learn that, for a variety of reasons, more physiology departments are becoming concerned with evaluating their teaching efforts. Many departments ask students to evaluate courses by filling out questionnaires that essentially rank resources, class activities, and faculty presentations in terms of usefulness. Student responses are probably based on how well they think the various course components helped them prepare for the examination. However, because the questionnaires are often completed before the final examination, and the examinations seldom reflect the learning objectives of the course, it is difficult to know whether the data from these questionnaires are meaningful as an assessment tool. Other departments try to evaluate presentation (lecture) style, assuming that, if material is well presented to students, the faculty making those presentations are effective teachers.

These approaches do not address the key question, however. The key evaluation question is, “How well have we accomplished the goals we have set for the course?” This, of course, assumes that the issues regarding course content and faculty role have been addressed. The task can be stated in another way. We have started with a baseline condition, we have perturbed the system in some way, and we wish to learn what effect the perturbation has had on the system. If this problem was to be addressed in the laboratory, we would gather appropriate base-line data, make the experimental intervention, and again collect appropriate data. Unless control data are obtained, the experiment is meaningless. The same is true for our teaching efforts.

We recently asked medical students in five institutions whether they had taken a physiology course before their medical physiology course. Seventy percent of these students indicated that they had taken a physiology course previously. Does the performance of these students on the final examination reflect the results of our teaching efforts or those of previous instructors? If we are to evaluate our efforts in a specific course, we must have some idea of what the students are able to do when they begin the course. A simple pretest-posttest design will give us the appropriate data. Our concern in this scheme is not with individual students but with the class as a whole. Hence, the pretest need not have student’s names or other identification associated with it. Such testing may lead to reevaluation of our entire course design. The results may indicate that the students are already familiar with common concepts, and these need not be covered in as great detail. On the other hand, we may find that our course goals are too ambitious, and we would serve students better by refocusing our course to concentrate more on basic principles.

A related evaluation question is, “How well have our efforts helped the student to establish a firm foundation for future physiological problem solving?” This question is more difficult to answer. To gain meaningful answers and learn more about how we can achieve this goal requires the cooperation of course directors later in the curriculum. Perhaps the time has come to establish better ties among preclinical and clinical teaching activities so that such questions can be addressed.

Challenges for the 1990s

Addressing these and similar issues will ultimately lead to an improved learning environment that will best serve students. Perhaps the biggest challenge for the nineties will be dealing with the cost of addressing these issues. The effort will certainly require a significant time commitment, a commitment that may impact on laboratory research programs of some faculty. Unless the academic reward system currently in force at most research institutions changes, it is doubtful whether faculty will be willing to invest this time. Funding for such efforts is another concern. In the past, few agencies have been willing to fund educational research and development efforts focused on improving physiology education. Hence, if the current medical school priorities continue, there seems to be little hope for major educational improvement in medical physiology curricula. However, if the physiology community is willing to make a commitment to improved physiology education, perhaps there are solutions to this dilemma. External funding for educational projects may become available if the physiology community makes granting agencies aware of the need for funding in this area.

Another approach may be establishing joint efforts between physiology departments. If external funding is not forthcoming, these programs could be funded by each institution contributing to the support of the effort. In this way, programs addressing the critical issues can be developed utilizing the energy and expertise of a cadre of physiologists who share a common interest in education. In this scenario, the reward system limitations would be overcome, because the faculty involved would have funded projects that would lead to publications. The departments involved would also maximize the benefit from their investment of resources. The critical issues related to their teaching efforts would be addressed, but FTEs could still be retained for faculty whose primary activities are focused on physiology bench research.