

PRINCIPLES OF ORGANIZING A NEURAL SCIENCE COURSE

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The following nine principles should be kept in mind when organizing pre-clinical medical student courses:

Course Content

An integrated neural science course should cover all of neuroanatomy and neurophysiology within a clinical framework. The sequencing of lectures should be logical. One approach, and that used at the University of Rochester, emphasizes the concept of "planned redundancy". All the material is covered at three different times: during an intensive overview; using a regional neuroanatomic approach; and using a systemic neurophysiological approach. Thus the student is exposed to the material on three different occasions, using three different approaches, and hopefully will incorporate the material more solidly.

Clinical correlation is provided in two different settings: in the lecture hall, and during small-group case-based exercises. The clinical content of the course is disease-oriented, and a balance is maintained between common, as well as uncommon but classic neurologic disorders.

Walk-on lecturers should never dictate course content. If a lecturer cannot lecture on an assigned topic, someone else should replace him or her.

Basic Science - Clinical Balance

As mentioned above, the basic science aspects of an integrated neural science course should be stressed, since this course is part of the pre-clinical curriculum. Clinical faculty often fall into the trap of teaching clinical neurology instead of clinical neural sciences in this type of a course. The course director must carefully guard against this occurrence, and insist on maintaining the basic science emphasis of the lectures. This being said, it is highly desirable to include clinical examples freely during the lectures to underscore the importance of the material being presented.

Course Format

A balance should be maintained between lecture and small group presentations. Lectures are a very efficient way for presenting large volumes of information. On the other hand, they are a very passive form of teaching. Case-based teaching in a small group setting is less efficient than lecture for presenting information, but is highly interactive. Students thus assimilate the material presented in these small groups better.

Patient demonstrations are also an excellent way to present material. Although these often occur in large-group settings, the students assimilate the material well because of the human dimensions of these presentations.

Case-Based Exercises

In order for case-based teaching to be effective, the cases need to be truly an integrated part of the course. An adequate number needs to be used, and these exercises should occur at least weekly.

In an effort to introduce case-based teaching into the pre-clinical curriculum, some courses have introduced only one or two case studies for the entire course. Such "case-study tokenism" is ineffective since it is perceived by the students as peripheral to the course, and therefore of little importance. Furthermore, the momentum of learning in the small-group setting is never achieved in this fashion.

Case studies should be fully integrated into the curriculum. Case studies are best written by clinicians, either faculty or neurology residents, and should be subsequently edited by a faculty member with thorough grounding in both the basic and clinical neural sciences. Cases written by basic scientists often appear artificial and therefore work less well.

It is important that small group leaders have a sufficient breadth of basic and clinical neurologic knowledge. Contemporaneous students are therefore not well suited to serve this function. We have found that by having two group leaders, namely a basic scientist and a clinical neurologist, the case studies can be discussed in appropriate detail and with sufficient emphasis on the basic science aspects of the case. We have also found it advantageous to use neurology residents as the clinical neurologists in the small groups. Not only do the students find the residents to be excellent role models, but the residents also appreciate the opportunity to re-learn basic neuroanatomy and neurophysiology.

Course Director(s)

The choice of course director is key to the success of a neural science course. This individual needs to have stature within the medical school, political clout, excellent teaching abilities, and must also be regarded as a mentor for the faculty. In addition, the course director needs to be fully knowledgeable in basic neuroanatomy and neurophysiology, and have an understanding, appreciation, and familiarity with clinical neurology. It is often difficult, if not impossible to find one individual who fulfills all these criteria. An alternate solution, and that which we employ, is to have two co-directors for the neural science course, namely a basic scientist and a clinical neurologist. As one would expect, however, the interpersonal relationships between these two individuals need to be positive. They both need to agree fully on the goals and objectives of the course.

Course directors need to be fully involved with the entire course. This includes attending all lectures and participating in all small-group sessions. Course directors also take complete responsibility for all examinations and grading.

Faculty

Course faculty should also have a fully integrated presence in the course. It is better to use a small number of faculty, each of whom teaches an entire block of the course.

Walk-on guest lecturers are intrusive and perceived as peripheral to the course by students, since they do not understand what was covered and what is to come.

Faculty need adequate supervision and mentoring by the course directors. Regular feedback should be provided to faculty concerning their lecture techniques. Since teaching is assuming more and more importance in the promotions process in medical schools, a mentoring relationship between the course directors and the teaching faculty could certainly strengthen the entire promotions process.

Finally, course directors and faculty should be justly compensated for their teaching efforts. Faculty time is costly, and faculty will understandably appropriate their teaching time based on remuneration. Deans and department chairs should "put their money where their mouth is" in order to ensure the success of undergraduate teaching programs in medical schools.

Syllabus

A well-written syllabus ensures that important material is covered. Moreover, by writing syllabus installments, lecturers are forced to organize their lecture content beforehand. Course directors can also use the syllabus to monitor the content of the entire course, and to identify any gaps that may exist in course content.

A very effective format for a syllabus is the extended outline form. Syllabi written in full sentences are easier to read and comprehend than those written in purely outline form. The various contributors to each syllabus section should standardize their installments as much as possible, including writing style and the font and layout of the material on the page. The syllabus should be paginated, have a table of contents and, ideally, an index. It need not be said that the syllabus be carefully proofread prior to distribution. Excessive typographical errors bespeak poorly of the quality of the entire course.

Syllabi should also be updated yearly to reflect new advances in the discipline, as well as to incorporate improvements in presenting the material, based on previous experience teaching the course.

Examinations

A well-written and integrated examination reflects positively on a neural science course. It demonstrates to the students that the course directors and faculty take great pride in all aspects of the course. Students perceive, perhaps inappropriately, that material asked on an examination is important. Therefore, examinations should be carefully constructed to emphasize important points.

Synthesizing information is most important in all aspects of medical school. Therefore, examination questions that test random recall of isolated facts should not be written. Uniformly, these questions tend to over-emphasize material of little importance and of questionable significance, trivializing the entire course.

Examinations should employ questions that test application of knowledge. These are typically 3-step questions, in which the student needs to recall information, synthesize it, and interpret it to answer the question.

A good method for writing "application of knowledge" questions is in the setting of a clinical vignette. For example, rather than asking the student what is the function of the posterior limb of the internal capsule, a patient can be described who has had a stroke involving this region, and the student can be asked to describe the consequences of such a stroke. This method of asking questions increases the "face value" of the examination, and stresses the importance of the material to the student.

It is desirable for all faculty to participate in writing examination questions. In order to do so effectively, faculty should receive instruction in writing test items. Questions should be standardized as much as possible among the various item writers. The examinations should be carefully reviewed and proofread by the course directors. It is their responsibility to discard or completely rewrite poorly written items.

Examinations should be graded in a timely fashion, and should be returned to the students. In this way, students receive feedback concerning their errors in thinking, as well as an evaluation of their performance in the course.

Course Review

The course directors and faculty should take responsibility for soliciting course feedback from the students, as well as from each other. Students are more apt to provide valuable feedback if they feel that it will have a positive effect on improving the course for the future. In our experience, the quantity and quality of student feedback concerning the neural science course was far superior when the feedback was solicited by the course directors, as compared with that solicited by the Dean's office.

The course directors and faculty should review the format and content of any course on a yearly basis. Student feedback should be considered at this juncture, and appropriate changes in course content and format should be made if indicated. We have found students to be extremely perceptive with respect to the organization of the course, and we have incorporated many of their recommendations over the years.