

Revisiting Therapeutics: Innovations, Restructuring, and Assessment¹

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The American Association of Colleges of Pharmacy's Commission to Implement Change in Pharmaceutical Education described the mission for pharmaceutical education in Background Paper I. The paper, which is entitled "Entry Level Education in Pharmacy: A Commitment to Change," describes the length and title of the entry level degree, the profession's support for Pharmaceutical Care as a practice philosophy, a plan to implement change in pharmaceutical education and the need for evaluation of education and practice. Pharmaceutical education's mission is to prepare students to "enter into the practice of pharmacy and to function as professionals and informed citizens in a changing health care system"(1).

The Commission followed with Background Paper II which identified specific outcomes and content for entry level curricula. Critical thinking, problem-solving, ethics, communication and self-learning abilities and social interaction are among some of the specific outcome criteria described in Background Paper II(2). Schools of pharmacy are challenged with revising their curriculums to embrace the current mission of pharmaceutical education, and reflect the outcomes and educational process detailed in Background Paper II.

The importance of critical thinking and problem solving ability is a prominent theme in Background Paper II. A variety of methods have been proposed to teach students problem solving. The Guided Design(3), and problem-based student-centered learning(4) have been previously discussed. Another method describes lectures on decision making skills, simulations, student presentations, and problem-solving based examinations as specific methods for teaching problem solving skills(5). The following presents an approach to teaching problem-solving in therapeutics instruction.

BACKGROUND

The Therapeutics series are a sequence of courses intended to facilitate the growth of problem identification, patient assessment, problem-solving, critical thinking, written and verbal communication, life-long learning and team work skills. The courses build upon each other in a manner which continually and increasingly challenge the student to advance their performance abilities. Therapeutics I is targeted toward developing skills in providing pharmaceutical care to patients with self-limiting illnesses. Therapeutics II is targeted to develop more advanced skills using problems associated with more complex disease states. In Therapeutics III, students continue working with complex disease state problems with increased focus on therapeutic controversies.

The philosophy of the course is to focus on skill development rather than information retention. While information is critical to successful problem identification and solv-

ing skills, defining the amount and type of information that is critical to know at the recall level is difficult and changes with time and practice environment. Developing self-learning skills and giving students the opportunity to gain experience in various situations, will allow the student to develop their database to meet their needs and learning style. It is proposed that the self-learned database will be more successful for the student (*i.e.*, they will be able to solve more problems).

COURSE DESCRIPTION

(Boxed sections are excerpts from course syllabi.)

The present course sequence is a culmination of a continual improvement process. The faculty's vision for the course sequence is essentially to be the best ability-based therapeutics course available to students. In this light, faculty retreats are held at least yearly to discuss strategic changes in the course, review progress made from the previous changes, and for faculty development. What is presented in the following dialogue is under continuous revision, and may not necessarily reflect the current course structure.

The courses are team taught by full time and adjunct faculty, and sequence into the curriculum the semesters immediately preceding clerkship and externship (*i.e.*, years four and five). The course, "Professional Communication in Pharmacy," precedes the Therapeutics sequence and introduces the students to the concept of pharmaceutical care and pharmacists' responsibility in patient care. The second semester of Pharmacology is taught concurrently with Therapeutics I. Baccalaureate students complete two semesters of Therapeutics, and Doctor of Pharmacy Students three semesters. The courses meet for one or two-two hour large group discussions ("lecture") and one-two hour small group discussion ("lab") per week. Therapeutics III does not have a separate laboratory section due to the small class size ($n \leq 15$); cases are discussed in class, and the class period is extended to three hour sessions. Exams are given every two to three weeks outside of classtime. A schematic of the course is represented in Figure 1.

Topics for discussion are determined each year based on two criteria: prevalence of the disorder or issue in practice and the expertise of current faculty. Flexibility is needed in structuring the course as healthcare and the mix of faculty expertise changes. Over the three course sequence, 75 topic areas are addressed, minimizing the potential to omit major disease states. Additionally, some disease states (*e.g.*, diabetes, hypertension) are addressed in more than, one course due to the complexity of the pharmacist's role in the disease state. Faculty are not asked to discuss topics outside of their expertise so as to "cover the topics." The focus on skills and

¹ Manuscript based on a submission to the 1993 Council of Faculties Innovations in Teaching Competition.

experience requires the faculty to be well versed in the topic to be able to provide insights into problem-solving. If identified topics are not within the expertise of the faculty, the topics are changed to fit the abilities of the faculty. Topics are assigned each year in the therapeutics retreat. Faculty are asked to rank their top ten topics prior to the retreat, and each faculty member is assigned one topic until all topics are assigned. Topics are preferentially assigned to practitioners prior to the retreat to allow the practitioner to teach in his or her area of expertise rather than count on them to fill in the gaps. The number of topics assigned to each faculty member is determined by the division chair prior to the retreat and is based on the Division's workload policy.

As depicted in Figure 1., the flow of the course requires students to complete some preparatory work prior to the large group discussion. Students are given the following information regarding the large group discussions:

(Excerpted from the 1992-1993 course syllabus.)

You will receive objectives and case studies for each lecture. You are expected to read the assigned chapter(s) prior to lecture and come to class prepared to discuss issues related to that day's topic and questions you have about the material provided in the text. In addition, you are expected to seek out and read additional material (e.g., Facts and Comparisons, Pathology Notes, Pharmacology Notes, prior texts, etc.) to help understand the information provided in the text. The first hour of the didactic component of the course will focus on your questions concerning the material covered in the chapter and on material that was either missing, more up to date or incorrect as viewed by the instructor. *Instructors will not tolerate students being unprepared for class discussion—this means they will not answer questions that are simply informational and should have been easily obtained from reading the chapter. This also means that if you are not prepared at the time of class, the instructor has the prerogative to dismiss class. You, however, will still be responsible for the material on the exam and in laboratory.*

The second hour of the didactic component of the course will focus on case discussions. The number of cases covered will be left to the discretion of the instructor and the aspects of the topic he or she wants to cover in more detail. The student should pay attention to the process and strategies by which the faculty works through the case, and feel free to ask any questions about how the faculty comes to a solution. It is this process that will help the student understand how drug therapy decisions are made, and will facilitate completing the case for discussion.

A small group discussion follows each one or two large group discussions. In the early stages of the course development, students were divided into four groups (n=15), and met for an hour and a half. The topic for the small group discussion is based on the topics for the previous week's large group discussions. The format of the small group discussion portion of the course took several years to develop. Initially, the course maintained a true didactic lecture followed by case discussions. The early case discussions were formatted such that students were given two or three cases at the conclusion of the lecture to formulate written responses to eleven standard questions.

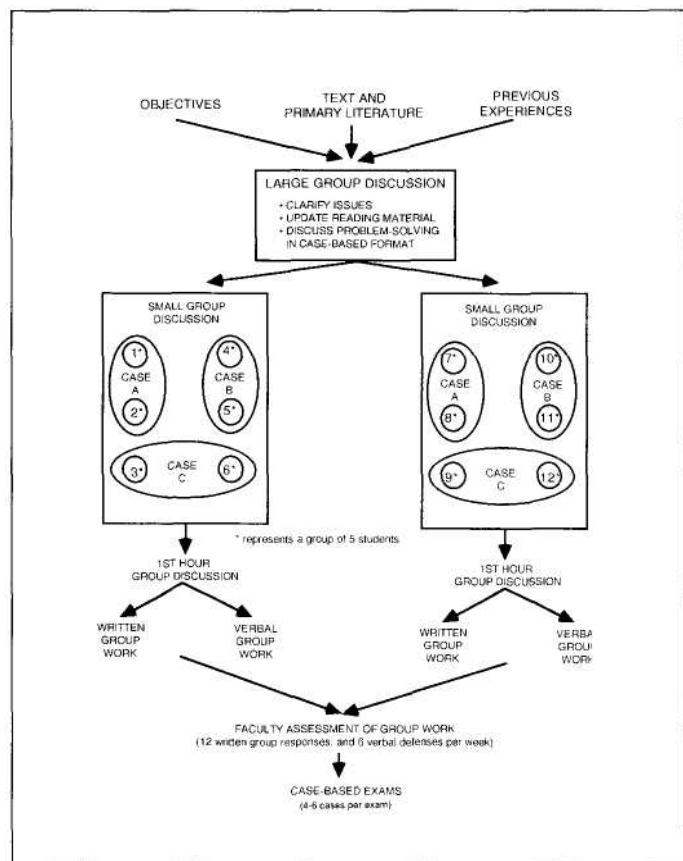


Fig 1. Schematic of therapeutics course.

Eleven Standard Questions for Case Discussion

(Excerpted from 1990 course syllabus)

1. What symptoms can you identify in the case that are consistent with the topic for today?
2. List at least three questions that you would ask to further assess the patient's problem.
3. List at least two factors that could be found in any patient that could effect the choice of treatment with this class of drugs. How would you assess these?
4. List at least two specific situations when referral is the most appropriate recommendation.
5. What is the therapeutic goal in treating this patient?
6. What treatment do you recommend for first line therapy in this patient and give at least two reasons why you made this recommendation?
7. What is an alternate regimen for this patient?
8. List two drugs that could potentially have a *clinically significant* drug interaction with the drug you have recommended.
9. List at least two nonpharmacologic interventions for this problem.
10. What would you tell the patient about when and what types of therapeutic effects to expect, and when and what types of side effects to expect?
11. What type of follow-up is necessary for this patient (assuming you did not refer to a physician immediately)?

During the discussion period, students were expected to spontaneously answer one of the eleven questions as the cases were discussed. Students were responsible for spontaneously answering ten times during the semester. Initially, students felt the eleven questions facilitated their thinking through the cases, but by the end of the semester were

unchallenged by the format.

Faculty found the questions did not apply in every case. In addition, faculty found students could develop predetermined answers that would be correct regardless of the scenario presented. Another problem faculty perceived was the assertion on some students part to answer easier questions more often than more difficult questions. Faculty were concerned about the consistency to which all students were held to the course objectives.

The eleven questions were an important step in the development of the course in that it made the faculty think consciously and in detail about the problem solving process they go through in practice and relate the process to the performance outcomes of the student. These questions were basic questions that needed to be thought about for each case presented to the student. However, a formal answer was not required for every question to solve the case. A more flexible design was needed. Further discussions resulted in a change of the questions to the following:

(Excerpted from 1991 course syllabus)

1. Identify and provide supportive evidence for the problems in the case that a pharmacist is responsible for.
2. Describe further data required, and provide potential solutions to the problems you have identified in the case.
3. Assess your potential solutions with regard to patient, drug, disease, and health care system factors.
4. For each of the problems you have identified, state your therapeutic goal, and make a specific recommendation for initial and second line therapy, and justify your answers.
5. Describe specifically how you would evaluate progress towards solution of the problem(s), and describe the rationale behind each monitoring parameter.

Prior to coming to small group discussion, each student again prepared written responses to the five questions for each case given in lecture. Students, however, were randomly and blindly assigned to present answers to single questions throughout the semester. Faculty felt the system was an improvement over the previous year. Students did not like the blinding aspect of the system, but felt they were usually more prepared to discuss cases.

Two issues led to further development of the case discussion aspect of the course. First was workload for the faculty. In both of the course structures presented, faculty provided comments to each student on their written work in lab and on exams. At a rate of upto 180 lab cases per week and 120 exam cases per lecture, it was impossible for faculty to carefully assess all cases.

The second issue had to do with student assessment. Faculty and students felt that students were not allowed to show their full potential (or lack thereof) if they were only assessed on one of the five questions. Indeed, practitioners have to function by utilizing all aspects of the case and basically would not be fulfilling their responsibility if they only did a fifth of a patient. Basically, a practitioner is responsible for identifying and solving all problems, and student learning should reflect that. We also found there is no standard way of thinking or presenting issues, and thus the assessment had to reflect this (*i.e.*, even more flexibility

had to be incorporated). Exams were also not reflective of the desired outcomes. Exam questions continued to be mostly information based, whereas the discussion groups focused on skill development. Students ended up working for the exam grade, more than for skill development.

The 1992-93 course format (see Figure 1) deals with the resource and assessment issues in a unique way. Students are currently given the following information regarding the small group discussions:

(Excerpted from the 1992-1993 course syllabus)

Lab will consist of two groups of approximately 30 students who will meet during the assigned time to discuss cases. The thirty students will be subdivided by the course coordinator into six groups of five students each. One of three different cases will be distributed to the students at the beginning of the laboratory (*i.e.* each case will be distributed to two groups). Each group of five students will then use the first hour of the laboratory to prepare a summary of the case, and identify what they would do for the case. The group will prepare a written summary to be turned in at the end of the lab period. During each laboratory session, all three cases will be verbally presented by one of the members of the group. That same member will also defend the group's response. The groups and member of the group that present will be randomly assigned. You could be called on at any time during the semester to provide a response. It is imperative that you attend your class section, and be prepared to answer the questions. A grade for the response will be assigned to all members of the groups based on the presentation of the group's representative. It is important that the group makes sure that all five members are competent and prepared to present the group's findings.

There will be six to seven presentations per group during the semester. Each student in each group will present at least one time during the semester. A maximum of 60 points is possible for participation. Each of the six presentations will be graded as passing or not passing. The group score will be determined by the percentage of the total presentations that receive a passing grade, (*e.g.*, if four of six presentations are passing, then the points assigned to each member of the group is 40 out of 60).

In addition to the presentation grade, 1 to 5 points will be awarded for the written material that is turned in by the group. All group members will receive the number of points awarded for the group's work. There are 13 lab sessions during the semester. Therefore, there are 65 possible points for written material. One copy of the written response will be turned into the instructor. The written cases will be graded and copied for each student by the instructor, and returned to the students.

Faculty time commitment has been substantially reduced by reorganizing the small group discussion into two groups of thirty, further subdivided into six groups of five. At the conclusion of the small group discussion on a topic, the instructor has to assess twelve written assignments rather than 180. Instructors are also able to give more feedback to the groups of students and do so in a relatively short period of time, a positive effect not evident at the time of the change in course structure. Allowing students to fully present and work through the case addresses the need for faculty to evaluate the student on their ability to apply the whole process to a case based problem. One potential drawback is

that students may only be assessed on their verbal presentation in small group discussion one or two times a semester.

Beyond the development of verbal and written communication skills realized by the current format for small group discussion, students are forced to depend on one another to be successful in the course (cooperative learning). The small group (n=5) setting forces the student to develop skills requisite for working effectively in groups, which in many ways mimics successful interaction with the health care team. Students learn from one another, and are exposed to many points of view and styles of learning. The broader experience in learning is felt to help the student to respond to many different problems and situations that may be present in their future practice. The faculty's role is very much a facilitator of the discussion among students. Often, the faculty have to maintain fairly rigid time boundaries, and unfortunately limit the students' discussion of a group's work to allow all three groups to present and discuss issues during the time allotted.

The format for the "answers" to the case during small group discussion is not established. Students are allowed to formulate their answer in any manner they feel comfortable with as long as it is complete and effectively communicates their thoughts. Generally, students utilize the standard assessment question they have to answer on the exam. Exams for the course are all case based. For each case there is a standard question the student has to answer. The question reads as follows:

(Excerpted from the 1992-1993 course syllabus)

Given the information in the case above, outline what you would do for this patient. First, list the assumptions you made about the case in determining your response. Then, (i) state the problems you feel you need to solved (2 points), (ii) state the therapeutic goal (1.5 points), (iii) identify the treatment (pharmacological and nonpharmacological) you would initiate and state why you chose this over other potential treatments (2 points), and (iv) list the monitoring parameters you feel are necessary to follow to determine success or failure of your treatment and the point at which aberrations in the parameter would cause you to intervene (2 points). (7.5 points total)

The question is printed in the course syllabus, thus providing the student guidance on what they will be held accountable for (*i.e.*, performance on the various aspects of the question). Experience has shown that during a two hour examination, six cases is the maximum number students can reasonably solve. In an attempt to decrease the number of cases per exam, an attempt was made to combine topics into a single case. For example, hypertension and angina were combined in one case. The utility of this strategy is uncertain, but looks favorable.

For the exams and the small group discussions, students are encouraged to bring in any reference material they find useful in facilitating their work. An observation of student behavior shows that over the course of the first two to three exams, the resources the students bring decrease from essentially every text the student has, to those they found useful on previous exams and case discussions. This behavior substantiates the notion that students are developing self-learning skills and are tailoring their learning style to improve their effectiveness and success at problem-solving.

Specific references for the course sequence are determined by the student. The course syllabus provides general guidelines for purchase of reference material. Generally, students are required to buy the current editions of the *APhA Handbook of Nonprescription Drugs*, one of the three general therapeutics texts, a general drug reference, a drug interaction reference, and a clinical laboratory reference. Suggestions are made under each category, and the books are presented to the students to peruse prior to purchasing. In addition, many of the references are made available to the students for use during the small group discussion which allows students to use a text prior to buying it. Again, the philosophy is to allow the student to tailor the educational experience to their needs and learning style. Generally, students are excited about the prospect of buying references they can directly take to their practice site after graduation, and often purchase more references than required for the course. Students spend a great deal of time looking at texts and asking questions of employers and faculty in making the decision of which texts to purchase. The relevance of the purchase to practice is a likely factor influencing the students' behavior. Generally, more students are buying texts for use in the courses relative to prior years when a substantial number of students did not purchase the required text.

EVALUATION

Many of the evaluative outcomes of the course have been provided in the prior discussion. The evaluation process is derived from principles of Total Quality Management. Problems with the educational outcome and process are identified via a number of mechanisms, those people involved with the process work to identify the root cause and identify a solution. The solution is then implemented and reevaluated. Many of the innovations in the course have been derived from this process.

Problem identification comes about through many avenues. Each year a Therapeutics faculty retreat is held to identify problems and brainstorm solutions. The retreat is fed with information gathered over the year from faculty and students. Students have input to the course coordinators via five mechanisms. First is the formal course evaluation, where students are encouraged to provide written comments to open-ended and anchored questions. Generally, the formal course evaluation is useful in that the students are relatively honest about the successes and problems with the course. The students have a sense of ownership in the course development because they have observed changes in the course that are a direct result of their input. The second source of input from students is exam surveys (see Appendix). The exam surveys have generally given information about individual instructors, or raise issues with the course that are unique to the time frame of the exam. The surveys also help provide information about problems early in the semester, and allows the faculty to adjust during the course, rather than waiting for the final course evaluation to make adjustments. The third source of input is via class ombudsmen. Generally, one male and one female student are selected to be a representative of the students to the course coordinator. Information generated via the ombudsmen is generally accurate, and "very pointed in terms of the issue that is raised. For example, the ombudsmen brought forward an issue in consistency of grading, and suggested that it had to do with the lack of guidelines for assessing the

students' responses. The fourth mechanism of input for students is an informal meeting with the course coordinator. Interestingly, the experience with informal meetings has shown that not much new information is gleaned in terms of identifying problems, but one gets a sense of the importance of one or more issues to students. The meeting also helps to solidify the commitment of students to the course philosophy, as they feel they can influence what is happening in the course. The fifth mechanism of input is an individual informal meeting of a student with the instructor or coordinator.

Further indicators of the success of the project is the performance of students during their experiential rotations. Feedback from clerkship instructors suggest students are generally better prepared for experiential activities, are more motivated to learn and have a more positive attitude about the profession. In addition, the observation that students with below average academic performance prior to the courses tend to improve their performance in the course sequence, suggests that the courses are flexible enough to allow them to adapt the coursework to their personal style of learning.

AREAS FOR CONTINUAL DEVELOPMENT

Utilizing the information gained from the evaluation process, the following issues are areas for potential development. These issues will be prioritized and assigned to teams to develop plans of actions for implementation of solutions.

- improvement of the consistency of grading coursework
- improvement of the return time for exams
- incorporate general writing skills assessment into the evaluation of students' written work
- incorporate more student self assessment
- examine how to assure competence of students independent of group performance
- increase the number and diversity of resources available to students during small group discussion
- define further the ability-based outcomes of the course
- develop a bank of cases accessible to all faculty
- incorporate peer evaluation of faculty performance
- establish a development process for new faculty, or faculty wishing to utilize the method of instruction
- increase the utilization of cases that have to be developed/assessed by the student (e.g., profiles, medical records, model patients)

FURTHER PERSONAL REFLECTION

The shift in teaching paradigm from information to performance requires a significant restructuring of the teaching methods employed. Two principles guided much of the development of the courses. First, students need to take responsibility for their own learning. Second, faculty had to assess students based on stated outcomes. These proved difficult, but useful course development guidelines. In retrospect, it was much more difficult for the faculty to give up traditional roles and styles. Students seemed to thrive on the experience and have to be given credit for much of the continued success and development of the courses.

Much of the impetus for changing the course was derived from the perceived lack of preparedness of students on clerkship, the AACP Commission to Implement Change Background Papers which supported the concept of the course change to problem-based learning, and the basic desire to do something new and better. Many of the changes

made were strategic and planned, but some were made with very little data—a leap of faith.

The success of the course echoes in the comments from students and colleagues, and provides much of the energy and reason for continued improvement. We knew we were on the right track when one student commented after the second exam, "That was fun."

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Am. J. Pharm. Educ., **58**, 319-323(1994); received 3/14/94.

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APPENDIX. EXAM SURVEY

Indicate your degree of agreement with the statement. 5 = High degree of agreement 1 = Low degree of agreement. DO NOT put your name on this evaluation. If you would like to discuss this exam with the course coordinator, you should call him or her as soon as possible.

ITEM	HI	LO
1. I felt that the exam questions were fair in general.	5 4 3 2 1	
2. I felt I had enough time to complete the exam.	5 4 3 2 1	
3. I was able to understand each question in terms of what it was asking.	5 4 3 2 1	
4. I felt prepared to take this exam.	5 4 3 2 1	
5. I felt the proctors for the exam eliminated cheating.	5 4 3 2 1	
6. I observed cheating during the exam.	5 4 3 2 1	
7. I thought this exam was one of the best I have taken.	5 4 3 2 1	
8. I found studying with others useful in preparing for the exam.	5 4 3 2 1	
9. I found reading the book chapters useful in preparing for the exam.	5 4 3 2 1	
10. I found reading other material useful in preparing for the exam (other books, primary literature, etc.).	5 4 3 2 1	
11. I found that using a "peripheral brain" helps me during the exam.	5 4 3 2 1	

What things did you do that you found useful in preparing for or taking this examination?

I feel the following considerations should be made when grading this examination:

Comments to the course coordinators: