ease. If Medicare prescription medication and utilization legislation is signed into law, there will also be an increased demand for such intervention.

Some professional pharmacy organizations have weighed in on the workforce issue with a call for the expansion of pharmacy education, either through the launching of new schools or augmenting enrollment at existing schools. There is no question that we are facing a significant shortage of qualified pharmacy practitioners in all areas of the healthcare workplace. But several questions must be answered before we know if this strategy alone is one that will produce the desired result of enhancing public health through the provision of high quality pharmaceutical care to all.

- How will robotics and centralized dispensing operations impact the time it takes to get a prescription filled and, more importantly, the time pharmacists have to engage in therapeutic monitoring, disease state management and patient counseling?
- What new roles for pharmacists will develop to change the workforce picture? Can the public health wait the five or more years it's going to take to educate additional qualified pharmacy practitioners?
- Who is going to staff the new or expanded pharmacy programs being advocated? Where will the new faculty members come from and how long will it take to educate them at the level required to assume positions on faculty?
- What alternative practice environment models can we develop to deal with the current shortage of pharmacists while avoiding a possible future glut?
- How can we best advocate for the profession to ensure that we conduct the business of educating practitioners in a manner that is both responsive and responsible?

Last year's Argus Commission wrestled with the workforce issue, but it is still one of the most pressing problems facing the profession and, in my view, still warrants thoughtful attention. This year's Argus Commission (led by past AACP President Dr. Mary Anne Koda-Kimble) will continue the workforce discussion, with an emphasis on exploration of innovative practice environment models that facilitate the delivery of pharmaceutical care by pharmacists.

You would have had to have slept through my entire address not to know that the principle theme for this presidential message was to ignite the passion for what we're about as pharmacy educators. Hopefully, you picked up on a second theme that has wound its way through this talk, and that is the need for balance. To maintain passion for anything, we must cultivate an internal energy through the peace and security that comes with a balanced life.

In dance (another of my great passions) the performance of an individual dancer is at its best when the dancer has found her/his "center". At that moment, they are totally in balance... confident of their own abilities, fully aware of the critical impact of their personal performance on that of the troupe, able to give themselves over completely to the passion of music and movement, and to energize others in the company to also perform at their best.

Each of us needs to examine what we do and how we do it in order to perfect our own performance with respect to our institution's mission and our collective vision of sound, contemporary pharmaceutical education. We need to understand and perfect our own role in the piece (that is, the curriculum, the academic program, or pharmacy and graduate education in general), and support others in the "company" in their quest for excellence with a full understanding and appreciation of the importance of the parts they play. Once each person has found his/her personal center, if they will simply share the intellectual and professional energy that invariably results with other faculty, the overall performance (our curricular, programmatic and Association outcomes) will be significantly energized, empowered and enriched. We will be in balance...ready and eager to passionately embrace the professional/personal challenges and opportunities that will most certainly be ours in this next century of pharmaceutical education.

Selected Presentations

Creation of a Dynamic Question Database for Pharmacokinetics[1]

Reza Mehvar
School of Pharmacy, Texas Tech University Health Sciences Center, 1300 Coulter Street, Amarillo TX 79106

PROLOGUE

Based on a model proposed by AACP Academic Affairs Committee(1), effective teaching normally involves the development of outcomes, pedagogical strategies to provide students with the opportunity to learn, and assessment tools to verify the achievement of the outcomes. Among these tasks, the development of validated and appropriate assessment tools to accurately test the achievement of specific learning outcomes is, perhaps, the most challenging and time-consuming task. In areas such as social sciences and humanities, most textbooks have an instructor's edition which includes an exam database of a large number of questions. However, most, if not all, of the available textbooks for the professional pharmacy education lack question databases. Therefore, pharmacy educators usually need to develop and validate their own assessment tools.

During recent years, pharmacy educators have used technology to facilitate student learning(2-5). Technology may also be used to facilitate the assessment process. For example, the National Association of Boards of Pharmacy currently uses a computer-adaptive method, instead of a paper format, for administration of NAPLEX. Additionally, some schools and colleges of pharmacy have started to use technology for course or curriculum assessment. For instance, Drake University College of Pharmacy (Des Moines, Iowa) and Texas Tech School of Pharmacy (Amarillo, Texas) have used web-based on-line testing programs, such as TestPilot (ClearLearning, Naperville, Illinois), for program and classroom assessments. The present work describes the use of computers for generation of dynamic questions for pharmacokinetics. It is hoped that

Table I. Examples of available functions in Microsoft Excel®a

Function	Examples
Mathematical	Absolute values; Exponents; Logarithms; Random numbers; Square roots
Statistical	Average and standard deviations; Intercepts; Slopes
Logical	And; False: If; Not; Or; True

aExtracted from the on-line help of the program.

with collaboration among pharmacokinetics instructors at different schools or colleges of pharmacy, a validated exam database will be developed which may be used nationally.

DESCRIPTION OF THE TEACHING INNOVATION

Student Audience

The innovation was introduced to second-year PharmD students as a part of a pharmacokinetics course (3 SCH) during the Fall of 1999. The course had an enrollment of 56 students. The Texas Tech School of Pharmacy requires that all students purchase a laptop computer and carry it with them to their classes. All classrooms are, therefore, equipped with internet connection ports for individual students. The class consisted of two 1.5 lecture hours (75 min) per week. The innovation was used for administration of quizzes in every class session during the last 10 min of the class time. The quizzes were related to the material covered during the same class period. Additionally, the innovation was used for administration of five progress exams, during the semester, and a final exam.

Process of Creation of Exam Database

The spreadsheet program Microsoft Excel® was used for the creation of the dynamic exam database. The program has a built-in formula function that can be used for manipulation of the contents of a worksheet based on simple arithmetic and/or more sophisticated predefined functions. Some of the most important functions useful for building dynamic questions in pharmacokinetics are listed in Table I. The general structure of questions was based on the exams that the instructor had prepared and administered during 12 years of teaching basic pharmacokinetics to BS and PharmD students. Generally, two types of questions were developed, dealing with calculation and conceptual outcomes as explained below.

Calculation Questions. These questions were based on provision of numerical data from which students were asked to calculate kinetic parameters and/or dosage regimens. Two examples for this type of questions are demonstrated in Figure 1 in which the static text is in regular font and the dynamic text or data is presented in bold font. Question 1 (Figure 1) asks for estimation of clearance of a drug from the provided plasma concentration-time data after a constant IV infusion of the drug. In this example, the rate of infusion is randomly selected for each student from a range of 2-120 mg/hr. Additionally, individualized plasma concentration-time data are generated from randomly selected kinetic parameters (within a reasonable range) with random errors (0-10 percent) added to each plasma concentration. To test the ability of students to recognize the correct units and convert different units to each other, the student is asked to provide his/her answer in a specific unit (mL/min in this case) which requires conversion from the provided data (L/hr). Question 2 (Figure 1) deals with the estimation of dosage regimens. In this question (Figure 1), total clearance, fraction excreted unchanged in urine, dosing rate in subjects with normal function, and renal function in a subject with renal dysfunction are randomly

Fig. 1. Examples of calculation questions. For illustration purposes, the dynamic data are shown in bold. Additionally, the texts in italic are added here for clarification.

selected from preset ranges. The student is then asked to determine the dosing rate in the subject with renal dysfunction.

Concept Questions. These questions were based on concept scenarios for which students were asked to select the best answer from multiple choices provided to them. Two examples of such questions are provided in Figure 2. In question one, the conversion of a drug to a metabolite takes place via a first- (or zero-) order process. Students are then asked to determine the rate of metabolism of drug (or production of the metabolite), generating four possible scenarios which are covered in the four given answers (Figure 2). In more complicated concept questions, both the provided information and the multiple choices are dynamic, increasing the number of possible scenarios to 8, 16, or 32. However, rarely, the number of multiple choices for each individual question exceeds five. In other types of concept questions, students may need to carry out some calculations before applying the results to analyzing a concept. Question 2 in Figure 2 is an example of the latter questions. In this example, students should first calculate the contribution of filtration clearance to the overall renal clearance before deciding on the mechanism(s) of renal clearance of the drug.

Creation of Individualized Questions. Each time the exam worksheet is opened, it automatically generates new random numbers. This means that each calculation question (Figure 1) can theoretically generate unlimited number of questions with similar structure and different data. The concept questions are also generated randomly from the number of available scenarios. Once the spreadsheet is open, new sets of questions may be generated by making the worksheet recalculate using new random numbers. Using this method, a total of 236 dynamic questions were created. The questions were divided into nine chapters and covered most topics in a basic pharmacokinetics course.

Question 1

The drug X is metabolized to the metabolite M in a **ZERO** *(Alternative: FIRST)* order process.

$$X \xrightarrow{K_m} M$$

The rate of change in the amount of **DRUG X over time (dX/dt)** *[Alternative: METABOLITE M over time (dM/dt)]* is equal to:

1. -Km
2. +Km
3. -KmX
4. +KmX

All 4 answers are possible (1 in this case).

Question 2

The renal clearance of kinetophylline is **19.4** *(range: 2-700)* mL/min and the free fraction of the drug in the blood is **0.29** *(range: 0.05-0.9)*. Assuming a glomerular filtration rate of 120 mL/min, what are the mechanism(s) ABSOLUTELY involved in the renal excretion of kinetophylline?

1. Glomerular filtration only

2. Glomerular filtration plus active tubular secretion

3. Glomerular filtration plus tubular reabsorption

All 3 answers are possible (3 in this case)

Fig. 2. Examples of concept questions. For illustration purposes, the dynamic data are shown in bold. Additionally, the texts in italic are added here for clarification.

Transferring Questions to World Wide Web

The process of selections of questions to be included in the exam (by the instructor) and generation of individualized exam and taking the exam (by the students) was transferred to World Wide Web using a system described before(6). Briefly, the instructor's preferences for each exam are stored as a record in a database for instructors. Students then use these preferences to generate individualized exams. Both the questions and answers are then stored on individualized records in a database for students, and only the question texts are sent to the browser of the student. Students enter their answers on-line, and after communication with the students' database on the server, correct answers and grades are returned to students. Using this system, students enter one answer at a time and receive feedback regarding their answer before proceeding to the next question.

What Instructors Do

The instructors' web site consists of the following option:
1. **General Instructions:** This link contains information about basic functions of the site and the process for setting up and using exams.
2. **Set Up/Edit Your Class List:** This link allows instructors to enter their students' names and IDs manually or by cut and paste from other programs. Students whose name and ID are not added here will not be able to generate exams.
3. **Design an Exam:** Using this link, instructors set preferences for each exam and select questions to be included in the exam. The preferences include start date, start time, stop date, stop time, duration of exam, number of times that
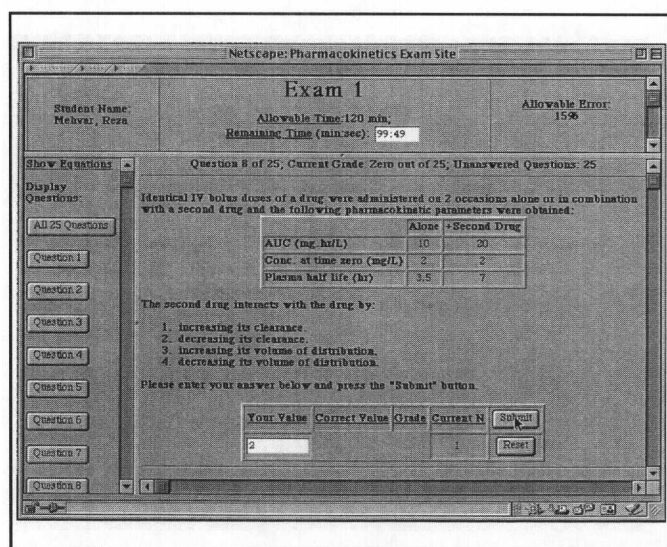
Fig. 3. A screen snapshot of the exam web page.

students are allowed to attempt answering each question, and percent error allowed for the difference between the student's answers and the correct answers. The date and time structure is very flexible accommodating very restrictive (all students take the exam only during a specified time) to very open (each student may take the exam at a different time during a date range) exams. For selection of questions, instructors are directed to nine different chapters from which questions may be marked individually or using a random selection function specifying the desired number of questions to be included in the exam. The program allows inclusion of up to 50 questions in each exam.
4. **Edit an Exam:** This link may be used to change the preferences and questions for an already designed exam.
5. **Publish an Exam:** After an exam is designed (*i.e.*, preferences are set and exam questions are selected or changed), instructors use this link to make a dynamic copy of the exam available to students.
6. **View an Exam:** This link is used to view the question contents of an already created exam. This version of the exam shows all different scenarios possible for each question.
7. **Create an On-line Report:** After students take the exam, an on-line report may be generated using this link. The on-line report lists the students' names, IDs, and their grades with a hyperlink for each student to a detailed page. The detailed page contains the exact exam that the student received along with student's answers, correct answers, and grades for individual questions. Other information such as the date, time, and duration of exam are also included.
8. **Create an E-Mail Report:** Instructors may create a detailed report of the students taking the exam as a comma-delimited text file. The file contains all the details about individual questions for each student and is sent to the instructor as an attachment to an e mail. Instructors may use the file to manipulate the assigned grade for each question or transfer the grades into a gradebook by cut and paste or import/export functions.
9. **Delete Students' Records of an Exam:** Instructors are allowed to create and administer up to three exams at the same time. If the instructor would like to change the questions and preferences for an already taken exam, the previously generated records of the students need to be deleted before the new exam can be taken.

Table II. Student evaluation of on-line exam modules[a,b]

Question	Mean ± SD
1. Having gone through the on-line exams, I like on-line exams administered in this course better than traditional paper exams.	1.38 ± 0.64
2. Submission of one answer at a time and receiving immediate feedback helped me do better in subsequent parts of the on-line exam.	1.26 ± 0.60
3. Submission of one answer at a time and receiving immediate feedback made the on-line exams a learning experience for me.	1.48 ± 0.71
4. I liked the fact that I could receive my exam grade immediately.	1.12 ± 0.48
5. Availability of on-line exams for further review after expiration of the exams was both convenient and beneficial to my learning.	1.46 ± 0.71
6. In my opinion, the individualized on-line exams would reduce the chances of possible academic dishonesty.	1.20 ± 0.53
7. The computer response in on-line exams was very slow.	2.58 ± 0.95
8. The computer response in on-line exams was so slow that made its use impractical.	4.10 ± 0.95
9. The use of on-line exams in this course should be continued.	1.18 ± 0.44
10 Given a choice, I always choose the on-line exams administered in this course over paper exams.	1.42 ± 0.67

[a]The scale was 1 = strongly agree, 2 = agree, 3 = neutral, 5 = disagree, 5 = strongly disagree.
[b]N =50.

What Students Do

The students' web site consists of the following option:

1. **General Instructions:** Here, students will find a brief overview of the site, its capabilities, and instructions about taking and reviewing exams.
2. **Take an Exam:** This is the main function of the students' site. Using this link, students create unique exams which allow them to submit their answers on-line and receive immediate feedback. Figure 3 demonstrates a screen snapshot of an exam. The exam page consists of three frames (Figure 3). The top frame shows the student and exam names, percent error allowed, the total allowed duration of exam, and a digital clock showing the remaining time. The left frame has buttons for selection of individual (or all) questions to be shown in the right frame. The top part of the right frame contains information about the current question number, current grade, and number of unanswered question (Figure 3). The text of the question also appears in this frame. Students enter their answer to the question in the provided space and press the "Submit" button (Figure 3) which sends the answer to the server and retrieves the correct answer and a grade for that question. The student can then proceed to another question or may select "All Questions" button from the left frame to display all questions in the right frame and submit answers to all questions at once.
3. **Retrieve Your Previously Generated Exam:** This link is used to retrieve an exam when the exam is interrupted during the allowable time because of various reasons such as computer crashes. When the exam is retrieved, the previously submitted answers will be displayed. In addition, the remaining time that the student has for completion of the exam will be shown.
4. **Review Your Exam:** If the instructor allows, students may review their exam after the exam has been expired. This option will show students the texts of questions, their answers, and the correct answers.

EFFECTS ON STUDENT LEARNING

Theoretically, the effects of the innovation on student learning could be due to several factors. First, because of the administration of every-day quizzes, students are likely to come to class prepared and learn more from the class discussion. Additionally, quiz questions provide students with an opportunity to practice for the exam which uses the same pool of ques-

tions. Second, the exam or quiz sessions become learning experiences because an immediate feedback is given to students who have an opportunity to correct an error before proceeding to the next questions with similar concepts or calculations. Third, the on-line availability of the exam for students to review after the exam expiration may positively affect the student learning. To determine the effects of innovation on student performance, the first on-line progress exam during the Fall of 1999 (N = 56) was designed based on the questions on the same exam administered during the previous year using a paper format (N = 107). The grade of students using the on-line exam (88.5 percent ±9.4 percent; mean ±SD) was significantly ($P = 0.02$; two-tailed t-test) higher than that for the paper format (83.8 percent ±13 percent). However, it should be realized that this comparison has its limitations. First, students participating in the two tests were not from the same class. Additionally, although the basic structures of the two tests were the same, the on-line test consisted of 56 versions (for 56 students) of slightly modified questions. Nevertheless, the innovation is expected to improve learning of pharmacokinetics.

EVALUATIVE DATA

Student evaluation of the on-line exam was conducted at the end of Fall semester of 1999. In general, students' responses to on-line exams were extremely positive (Table II). Despite some apprehensions at the beginning of the semester, students liked the on-line exams better than traditional paper exams (Question 1), and strongly agreed that they would choose the on-line exam if they have a choice for the exam format (Question 10). Of particular note are the students' responses regarding the academic dishonesty; students strongly agreed that on-line exams would reduce the chances of academic dishonesty (Question 6) because each student would receive an individualized exam. Some students felt that the on-line exams were slow (Question 7). However, students disagreed with the statement that the speed of the on-line exam would make it impractical to use (Question 8). Overall, students strongly believed that the use of on-line exams should be continued in this course (Question 9).

PERSONAL REFLECTIONS AND FUTURE DIRECTIONS

Because the development and validation of scenarios or questions are very time consuming, most pharmacy faculty are very protective of their assessment tools. In extreme cases, instructors

may not even allow students to review their exams because instructors would like to re-administer the same questions in future classes. Believing that students have a right to have free access to questions on already-administered exams, in the past, a significant portion of the author's instructional time has been spent on development of new questions for each exam. However, the author believes that significant advances in technology in recent years may allow instructors to reduce this time commitment by utilizing computers for generating questions and sharing questions among colleagues. The present work was, therefore, a first step in this direction. Questions were designed to test specific learning outcomes that were communicated to students explicitly. However, multiple dynamic scenarios were created using a spreadsheet program to test the same outcome. Therefore, the same general question may be asked at different times without the fear of students memorizing the answers. For example, if the outcome is to estimate the clearance from the plasma concentration-time data and dosage regimen, one dynamic question (Figure 1, Question 1), generating different plasma concentration-time data and dosage regimens, may be shared with students both during a quiz and an exam. This is in addition to other advantages of the innovation which are related to the fact that these questions can be administered on-line. These advantages include no need for copying, distributing, and collecting exam papers, no manual grading of the exam by the instructor, immediate feedback to students on their performance, and the convenience of exam review for both the instructor and students.

The initial evaluation of the innovation by the students was very positive (Table II). However, there are a number of improvements which need to be made gradually during the next few years. One important issue for the use of the innovation, especially during the class time, is the speed of the modules. This is very important, particularly if more colleagues from other universities are to use the innovation. Although students felt that the speed of the modules was reasonable (Table II), improvements in the structure of the web-database-spreadsheet interactions should be considered before the innovation can be expanded to too many institutions.

Another planned improvement is expansion of the exam database questions. The author plans to request submission of pharmacokinetics questions from kinetics instructors, for incorporation into the database. The long-term goal is the development of a web-based, validated pharmacokinetics exam database which can be shared with colleagues from other institutions. This is a very important goal because currently the performance of students in individual courses at most schools and colleges of pharmacy is measured by internal tools which are developed by the instructor(s) responsible for teaching the course. The author believes that this system is far from ideal because performance of students at different institutions cannot be compared. Additionally, there does not exist an objective measure for effectiveness of a teacher based on how well students have learned the material. Development of a national assessment database that has been compiled and approved by pharmacokinetics instructors at different schools and colleges of pharmacy can serve as an external standard for performance of students. This challenging task, however, requires the cooperation and involvement of both pharmacokinetics instructors and pharmacy education organizations such as the American Association of Colleges of Pharmacy and American Council on Pharmaceutical Education.

References
(1) Cohen, J.L., "A bias for action-epilogue," *Am. J. Pharm. Educ.*, **63**, 433-435 (1999).
(2) Brimberry, W.M. and Riffee, W.H., "Computers in the classroom: A new form of active learning," *ibid.*, **59**, 1-7(1995).
(3) Haworth, I.S., Bolger, M.B. and Eriksen, S.P., "Use of computer-based case studies in a problem-solving curriculum," *ibid.*, **61**, 97-102(1997).
(4) Mehvar, R., "Computer-assisted generation and grading of pharmacokinetics assignments in a problem-solving course," *ibid.*, **61**, 436-441(1997).
(5) Sosabowski, M.H., Herson, K. and Lloyd, A.W., "Implementation and student assessment of Intranet-based learning resources," *ibid.*, **62**, 302-306(1998).
(6) Mehvar, R., "On-line, individualized, and interactive pharmacokinetic scenarios with immediate grading and feedback and potential for use by multiple instructors," *ibid.*, **63**, 348-353(1999).

Incivility[1]

Bruce A. Berger[2]

Pharmacy Care Systems, 128 Miller Hall, Auburn University, AL 36849-5506

PROLOGUE

Despite our best efforts or because of inappropriate efforts, incivilities between faculty and students occur. Some believe that classroom incivilities are on the rise as a result of a consumer mentality on the part of students. Others blame the problem on ill-prepared and indifferent teachers. Regardless of the reason for incivilities, when they occur they can have devastating effects on faculty self-efficacy and self-concept, hurt morale of both faculty and students, make classroom environments emotionally unsafe, and impede student learning. This manuscript attempts to define and describe incivilities between college faculty and students, identify reasons for uncivil behavior, and offer solutions, based upon research findings, of how to prevent and/or manage uncivil behavior.

INTRODUCTION

A student walks into class ten minutes late, climbs over (and disrupts) four other students, and slams his backpack down on his desk. Another student's cell phone goes off in the middle of class and rather than leave the room, she proceeds to have a five-minute conversation. After receiving his grade on his midterm exam, a student raises his hand and states belligerently, "This exam sucks and this course sucks." A student walks into your office without knocking, throws a class paper onto