



# Annual Report 2009



UNC

CENTER FOR EDUCATIONAL  
EXCELLENCE IN PHARMACY

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## **I. Letter from the Director**

I am pleased to provide the following information regarding activities of the Center for Educational Excellence in Pharmacy (CEEP), a unit dedicated to enhancing teaching and learning at the University of North Carolina Eshelman School of Pharmacy. This 2008-09 Annual Report marks the end of our first year on campus.

Despite the relative youth of this Center, we have made significant progress during our inaugural year. This progress, of course, is a reflection and outcome of the commitment and collective efforts of the faculty. We have attempted to capture as many “highlights” of faculty activities in the general areas of teaching and instructional innovation as possible. Some of these accomplishments were in collaboration with CEEP; others were not. We believe it is important to appropriately acknowledge and celebrate the success of our faculty colleagues in addressing the educational mission of our School. If we have missed any, please forward the information to us and we will amend our report accordingly.

The generosity of our donors, Dr. Fred Eshelman and the Pharmacy Network, deserves particular mention. The funding provided to date has allowed us to pursue a variety of activities in the general areas of teaching, learning, and assessment, including development of novel course content delivery systems. Their support was a key element to the success we have experienced this year.

I am deeply grateful to the teaching assistants, faculty, chairs, deans, and campus administrators who devote their time and talent to enrich the educational environment at Carolina in general, and within our school in particular. Of specific note is the Center for Faculty Excellence, which serves as a constant reminder that teaching and learning, in all of its dimensions, are at the very heart of our University. I would also like to offer special thanks to Dr. Adam Persky, who has brought tremendous enthusiasm, energy, and expertise to the Center. He has been responsible for the lion’s share of CEEP’s activities to date, and has jump-started the Center’s efforts in several areas, most notably faculty development.

Sincerely,

Dr. Gary M. Pollack

Director

## II. Goals of the Center for Educational Excellence in Pharmacy

The University of North Carolina Eshelman School of Pharmacy (referred to as the School hereafter) places significant emphasis on providing quality educational experiences to students in each of our curricula and program areas: professional, graduate, post-graduate, and continuing education. The School's mission is "*To advance health care through innovation and collaboration in pharmacy practice, education, research, and public service*". As part of this mission, the School's faculty aspires to provide innovative and contemporary educational experiences of the highest quality to each of our students. As such, the faculty values student-centered learning, and places the highest priority on learning and teaching in all of its forms. Finally, the School's strategic plan seeks, as one of its aims, to "*Transform the educational process to prepare professional and graduate students to enter into their profession and continue to develop throughout their careers.*" This focus on education at a research-intensive university leaves no doubt that student learning is a defining feature of our School.

The Center for Educational Excellence in Pharmacy (CEEP) is an independent entity within the School, but operates in close conjunction with several other elements in the School (the Office of Assessment and Curriculum, the Office of Professional Education, the Assessment Committee, the Curriculum Committee, and the Campbell Mentoring Program) as well as the Center for Faculty Excellence on campus. CEEP has begun to work with these existing units and programs to conduct research, to evaluate the efficacy of various educational strategies, and to disseminate the results of these efforts. In sum, these activities are directed towards not only improving the educational experience for our students, not simply faculty satisfaction with their contributions to the School's teaching mission, but to raise the profile of scholarly activities at Carolina within the educational domain. CEEP has begun, and will continue, to coordinate the collection of evidence of best practices emerging in the literature, to inform the ongoing development of the School's faculty programs, and to stimulate our growing community of educational scholars.

## III. Resources and Programs

CEEP undertook numerous and varied projects throughout its inaugural year. In most cases, these activities were designed to begin the process of building a foundation for future growth. Major initiatives in teaching development included: acquisition, construction, or implementation of resources for faculty to enhance their teaching practices; increasing the publicity of teaching practice; and consulting with individual faculty on specific elements of their individual teaching practices.

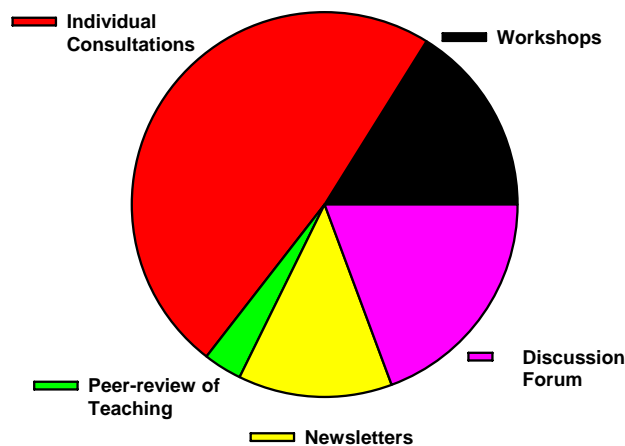
### A. Consultation

In its first year CEEP consulted with faculty, residents, and graduate students to address issues of teaching, learning, and career (predominantly faculty) development.

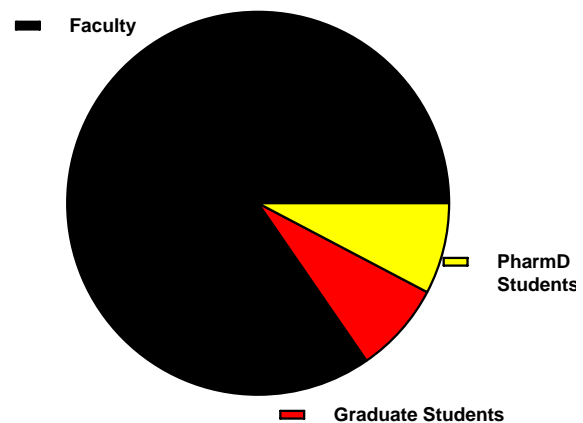
Many of these consultations resulted in collaborative efforts that have improved, or have the potential to improve, our programs and services.

## 1. Individual Teaching Consultation

Significant time was devoted to individual teaching consultations, particularly with faculty who have responsibility in the professional program. In most cases, the consultation included discussion of how to improve selected classroom activities (e.g., improving cases, incorporating more active learning opportunities, etc.) Consultations with graduate and professional students were associated with either classroom presentations or teaching responsibilities. CEEP continues to coordinate the Educational Discussion Forum which meets approximately once a month. This past year CEEP assisted in the DPOP seminar series, which was devoted to teaching graduate students the principles of teaching and learning.



**Figure 1A:** CEEP activities (presented as percentage of total occurrences) directed at improving teaching practices within the School



**Figure 1B:** CEEP consultations with various contributors to the School's educational mission.

## 2. Consultation Outside the School

CEEP has interacted with teaching and learning entities outside the School. The American Society of Health-System Pharmacists (ASHP) consulted with CEEP regarding innovative methods for their continuing education efforts. In addition, CEEP has assisted the University's Center for Faculty Excellence with its graduate student teaching assistant orientation, which occurs during the summer just prior to the start of the school year.

### ***B. Instructional Resources***

CEEP maintains a webpage and library of instructional resources available to all faculty and students. The webpage contains basic material related to teaching and learning, as well as archives of newsletters and selected online videos. CEEP also produced guidance documents on a number of teaching-related topics, including *Developing Teaching Portfolios*, *Crash Course in Course Design*, and *Guide to Designing and*

*Printing Posters.* These resources can be found on the Center website [www.pharmacy.unc.edu/ceep](http://www.pharmacy.unc.edu/ceep) under Forms & Guidelines.

### **C. Instructional Innovations**

CEEP has contributed to the development of the School's teaching environment in various ways. During the fall semester, CEEP tested several audience response systems (ARS) to help encourage active participation in classes. In January, CEEP and the Office of Curriculum and Assessment purchased ARS devices for piloting in PY1 and PY2 classes. During the spring the PY2 courses beta-tested the system. At the end of the spring semester a survey of faculty and students was conducted regarding use of the system. This survey was designed to assess whether the system should be implemented on a curriculum-wide scale. A summary of this survey is provided here, with complete results in Appendix I.

- A substantial majority of faculty who completed the survey favored full implementation of the ARS.
- Faculty felt that using the ARS was an improvement as compared to other techniques used to assess students' ability to recall facts and apply concepts.
- Students felt use of the ARS helped them maintain interest during class and allowed them to gauge their own understanding of the material.
- Almost half the students responding used the ARS for their own presentations; the remaining students indicated they would use it for presentations if given the opportunity.

In addition, the Center continues to support development of the web-based course for PHCY 434, *Pharmacy Management*. The initial web-based course, *Foundations in Pharmacokinetics*, was completed in March 2009. Data have been collected on the use of this novel and sophisticated instructional tool. A summary of results is provided here, with the full report in Appendix II.

- Students are comfortable learning foundational knowledge on their own, given appropriate instructional resources (instructor-developed material, formative quizzes, problem sets, and other self-assessments). The web-based tool fulfills this requirement.
- The linear multi-media learning environment represented by the web-based tool appeared to be equivalent to static material (e.g., electronic textbook) developed with a similar teaching philosophy in terms of student capabilities with foundational material.
- The current cohort of students did not prefer technology-based content delivery to reading.
- The current cohort of students preferred a small-group class format compared to the traditional large class, and preferred more structured activities (e.g., case studies, problem solving sessions) to an un-structured, Socratic discussion.
- Development of web-based multimedia tools is resource-intensive. It is estimated that close to 2000 faculty-hours were invested in developing this course over a 3-year period, with an approximate 100-to-1 faculty time to final narration time ratio.

However, the process of developing this course revealed several areas in which efficiencies could be introduced in the development of additional courses. These include:

- Creating a “course concept” map prior to developing any of the multi-media tools.
- Composing a penultimate draft of scripted materials before embarking on animation and narration activities. The approach taken for the Foundations in Pharmacokinetics course (and to a lesser extent the Pharmacy Management course) was inefficient, and required multiple iterations between course instructors and the technology team. A streamlined approach of agreeing to a course structure with the technology team, then developing all relevant course material (text, scripts, simple animation storyboards, etc.) will be necessary for future efforts in this area.
- Utilize a blending of static and dynamic material. A mixture of narration and animation to illustrate dynamic points, together with reading and more traditional static material when appropriate, will facilitate course development without eroding the utility of the approach or changing the underlying philosophy.
- Significant research remains to be performed to identify optimal strategies for presenting foundational information, and for assessing the efficacy of any new strategy that is explored. It will be important in this regard to begin collaborating with educational scholars to ensure that important information is captured and interpreted in a manner consistent with contemporary practice in this discipline.
- The transition to more student responsibility in learning requires instructors to become increasingly aware of how to optimize learning outside the classroom and how to use in-class time to in more active ways. This will require significant effort in educating and supporting faculty. CEEP is prepared to provide as much support as possible, and continues to operate under the philosophy that students will learn more, and be better prepared as professionals, if they accept a larger responsibility for their own learning and if they are actively engaged with their faculty role models and mentors.

The Center is the point of contact for those faculty interested in developing technology-based tools for their courses.

#### ***D. Infrastructure and Process***

To enhance teaching practice, it is important to have transparent processes and infrastructure to support change. CEEP’s inaugural year has been devoted primarily to establishing resources and appropriate processes. CEEP has drafted a document to establish definitions on teaching expectations and teaching excellence within the School. The definitions of teaching expectations are being used to help establish a peer-review of teaching process for formative purposes. This process will have several steps, including initial consultation to discuss the purpose of review, the review itself (e.g., classroom or other), face-to-face de-briefing, and provision of a written summary. This process may be further developed as a summative assessment for purposes of

annual reviews, promotion, tenure and post-tenure review. The present focus, however, is on faculty development. In addition, the definitions of teaching excellence could be used to support the Academic Excellence Awards in Teaching, in a continuing effort to promote and highlight teaching excellence. The definitions and guidance documents are being reviewed by the School's Curriculum and Assessment Committees.

## IV. Contributions to Higher Education

### A. Staff Responsibilities

During the 2008-2009 academic year, Center staff members included: the director; an associate director, a coordinator of teaching technologies; and a graduate instructional designer.

The *Director* (**Gary Pollack**) oversees the direction of the Center and manages the contacts with on-campus and off-campus partners. He also is a professor in the Division of Pharmacotherapy and Experimental Therapeutics and Executive Associate Dean for the School, and is a member of the Professional and Organizational Development Network in Higher Education (POD).

The *Associate Director* (**Adam Persky**) directs faculty development efforts. He assists the director with the full range of CEEP projects, and offers workshops and individual teaching development consultations for faculty, residents and graduate students. He also serves as course coordinator within the School for two-core courses and an elective as an associate professor in the Division of Pharmacotherapy and Experimental Therapeutics. He is a member of the Professional and Organizational Development Network in Higher Education (POD) and has attended their annual meeting.

The *Coordinator of Teaching Technologies* (**Casey Emerson**) is responsible for the "teach"nology program and supports faculty efforts to integrate technology into classroom instruction. He provides a vision of how technology can best be used to improve teaching and learning, provides consultation with individual faculty and presents training to faculty with an emphasis on the selection, evaluation and use of instructional technologies. He is a member of the School's Information Technology group.

*Instructional Design Support* (**Stephen Chan**), supports the Center's efforts to integrate technology into classroom instruction. He develops multimedia projects designed to assist students in solving complex problems. His projects include developing online video tutorials, managing audience response systems, and creating small multimedia projects for professors. His position provides a vision of how technology can best be used to improve teaching and learning; provides consultation with individual faculty and presents training to faculty with an emphasis on the selection, evaluation and use of instructional technologies. He is a graduate student in the School of Information and Library Sciences (SILS) program.

The *Director of the Office of Curriculum and Assessment* **Kim Deloatch** is affiliated with the Center through her coordination of the professional program including the newly-developing assessment program. She serves as a consultant for teaching, learning and assessment practices, and contributes to the *Time Out for Teaching* newsletter. She is a major part of faculty development efforts within the School. She is a member of the Professional and Organizational Development Network in Higher Education (POD).

## **B. Publications and Presentations**

During 2008-09 CEEP staff produced the following publications and presentations related to teaching and learning:

### **Publications**

1. **A.M. Persky**, An exercise prescription course: helping to support public health and improving pharmacy students' confidence in patient counseling, *Am J Pharm Educ*, accepted.
2. **A.M. Persky** and **G.M. Pollack**, A hybrid jigsaw approach to teach renal clearance concepts, *Am J Pharm Educ*, in press.
3. **A.M. Persky** and **G.M. Pollack**, Immediate feedback, answer-until-correct examinations in a core-curriculum pharmacokinetics course, *Am J Pharm Educ*, 72(4) Article 83, 2008.
4. **A.M. Persky**, Multi-faceted approach to improve learning in pharmacokinetics, *Am J Pharm Educ*, 72(2) Article 36, 2008.
5. R. E. Dupuis and **A.M. Persky**, Initial experience in using case-based learning in a clinical pharmacokinetics courses, *Am J Pharm Educ*, 72(2) Article 29, 2008.

### **Presentations (Oral)**

1. **A.M. Persky**, *Getting of the pedagogical couch: teaching exercise science in the 21<sup>st</sup> century*, American College of Sports Medicine annual meeting (2009), Seattle, WA
2. **A.M. Persky** and **C. Emerson**, Innovative approaches in teaching: adaptations to continuing education programs, American Society of Health Care Pharmacists (ASHP), webinar
3. H Coker, J Settlemyer, and **A.M. Persky**, *Bringing experiential education into the classroom: service-learning in a professional program*, Lilly South Conference on College and University Teaching (2009), Greensboro, NC
4. **A.M. Persky**, *Teaching with Technology: Video teleconferencing*, School of Nursing, University of North Carolina, 2009, Chapel Hill, NC
5. **A.M. Persky**, *Teaching the Next Generation of Learners*, Pediatric Pharmacy Advocacy Group (PPAG) meeting (2008), Baltimore, MD.
6. R.A. Blouin, P.U. Joyner, **A.M. Persky**, and **G.M. Pollack**, *Educating the Next Generation of Pharmacy Students: An Educational Renaissance at the UNC Eshelman School of Pharmacy*, American Associations of Colleges of Pharmacy (AACP) National Meeting 2008, Chicago, IL

## Presentations (Poster)

1. J.M. Padowski, **A.M. Persky** and **G.M. Pollack**, "*Development and Delivery of a Short Course in Integrative and Organ Systems Pharmacology*, American Association of Colleges of Pharmacy (AACP) National Meeting, 2008, Chicago, IL.

## V. Academic Environment

The School aspires, as part of its strategic plan, to improve the academic environment (Strategic Initiative IV). Under the auspices of this initiative, CEEP has undertaken a variety of activities. For example, CEEP announced and coordinated the American Association of Colleges of Pharmacy / Walmart travel scholarship. This scholarship is intended to promote an academic career to professional students, graduate students and residents. This year there were approximately five applications sent from the School or affiliated faculty, with two being awarded; a total of 60 awards were given nationally. The Center has sponsored several events to contribute to the social environment of the School, including activities associated with State Employees Combined Campaign. There were five events in total and were the SECC Breakfast, SECC Spaghetti Lunch, pumpkin decorating contest, Chili Challenge and the PY2 Pharmacokinetics Cookout.

## VI. Challenges, Opportunities and Future Direction

The information age demands that we change our approach to education. At the same time, the School's strategic plan seeks to improve educational processes, and indeed to place education on the same proverbial pedestal as research with regards to importance. This change is the major challenge to the Center and the School and also provides the most opportunity. One of the challenges is faculty time commitments and incentives, most notably those related to research and scholarship. In the current environment there are notable issues in faculty motivation for addressing teaching, learning and assessment issues in the professional program. Experience of the Center and standing committees of the School to date demonstrates that significant consultation, faculty development and faculty effort are required to create systems to promote and evaluate students' critical thinking, problem-solving, lifelong learning, communication, and interpersonal skills. Faculty ambivalence regarding these priorities has been apparent in the past, with the burden falling disproportionately on a handful of individuals. Consideration of whether or not to change an educational strategy or approach (or even to alter basic content) often is a low priority; once a decision to change is made, implementation can be slow, incomplete, and ultimately ineffective. Faculty often are resistant to adopting a learner-centered (as opposed to instructor-centered) approach because they feel learner-centered approaches might dilute content or erode rigor. To change this, we must create an environment that meets several criteria: provides positive reinforcement, conveys enthusiasm, creates awareness of value, maintains global awareness, cultivates personal responsibility, fosters supportive interpersonal relationships, links an individual's intrinsic self interest with that of the program, and structures experiences that show relevance. It is generally acknowledged that several elements must be in place to create and maintain a teaching culture that

encourages evidence-based education or instructional innovation: a high level of administrative commitment and support for the endeavor, faculty involvement with shared values and a sense of ownership, a broad definition of scholarship that includes the scholarship of education, a teaching demonstration as part of the hiring process, frequent interactions among faculty, a faculty development program, supportive and effective unit leaders, and connection of promotion and tenure to rigorous evaluation of teaching. Several of these characteristics were in place or in development at the time the Center was launched. Others are currently works in progress.

Ultimately, the primary aim of the Center is to enhance the educational environment and put in place systems to help faculty create a learner-centered environment and pursue educational scholarship. The CEEP is working with standing committees of the faculty to define teaching expectations, to develop processes to help faculty achieve these expectations, and to implement systems to recognize those individuals who achieve teaching excellence. The Center also hopes to establish a system of small grants to allow faculty to travel to educational meetings or pursue proof-of-concept work in the educational arena. Finally, the Center hopes to facilitate access to resources to help build educational material that may require narration, animation or other types of programming.

## **VII. Teaching and Learning Accomplishments, AY 2008-09**

As the educational practices of the School evolve, it becomes increasingly important to acknowledge those who contribute to our core educational mission. Our faculty and preceptors have accomplished much this year with respect to advancing the educational practices of the School:

### **School**

- J. Campbell named Class of 2010 Instructor of the Year
- Pharmacology has been integrated successfully into the PY2 Medicinal Chemistry and Pharmacotherapy courses. In the upcoming year integration will occur into the PY1 Introduction to Pharmacotherapy course and the PY3 medicinal chemistry and pharmacotherapy courses.
- Blouin, Caiola, Cox, Davis, Deloatch, Dinkins, Leadon, Joyner, Miller, Persky, Pollack and Settlemyer attend the American Association of Colleges of Pharmacy annual conference and workshops (Chicago, IL)
- Coker, Cox, Koval, Miller, Persky, JE Rodgers, Rothrock-Christian, and Settlemyer attend Lilly South Conference on College Teaching (Greensboro, NC)

### **DPET**

- Corbett and JE Rodgers use quizzes and cases to engage students in learning dosing/therapy guidelines.

- Dupuis and Persky continue the use small group, case-based learning in Applied Pharmacokinetics course
- C. Lee attended workshop at the Center for Faculty Excellence
- Persky and J.E. Rodgers were promoted to Clinical Associate professors in part for their contributions to the teaching mission
- Persky and Pollack complete development of their web-based, multimedia module. It has been used for the previous two-years within the Foundations to Pharmacokinetics course
- Persky and Pollack continue the use small groups in Foundations to Pharmacokinetics course. They also continue to use immediate-feedback assessment for examinations.
- Persky Class of 2009 Best of Overall Instructor
- Persky continues to use service-learning in his Exercise Prescription elective.
- Persky (with PY2 Murray) were Walmart/AACP scholars
- Williams incorporated pre-class quizzes assessment student knowledge and understanding prior to class In addition, with PY1s he has introduced open discussions concerning contemporary topics (or current events) happening in some aspect of pharmacy.

## DPPEE

- K. Campbell, Canaday, Cox, Davis, Dinkins, Deloatch, Hitch, Kemp, Foushee, Leadon, Robertson, Scolaro, and Scott contribute articles to the Center's Time Out for Teaching newsletter.
- Coker and Settlemyer (and Persky) present their service-learning courses at the Lilly South Conference on College Teaching (Greenboro, NC)
- Coker (with PY3 Johnson) and Miller (with PY4 Gunter) were Walmart/AACP scholars
- Coker continues to use service-learning in her Public Health elective
- Cox presents 2 posters at the American Association of Colleges of Pharmacy annual meeting
- Cox, Dinkins, Scolaro attend workshops sponsored by the Center for Faculty Excellence
- Cox and P. Rodgers continue to use a modified form of team-based learning in the ambulatory-care elective.
- Dinkins named Class of 2012 Instructor of the Year
- Dinkins introduces MTM encounter and role play in PHCY 401 (students work as a team to collect subjective and objective information from their TA who is posing as a patient at a MTM clinic)
- Dinkins, Ferreri, Stegall-Zanation utilizes Nonprescription Aisle assignment in PHCY 404 - students visit a community pharmacy and record information about OTC product lines. Following their collection of information, students speak with a pharmacist on duty about product recommendations within that line (i.e. Tylenol, Nyquil, Dimetapp, etc. brand name lines).
- Dinkins incorporates APhA's Career Pathways program in PEP (PY1, spring semester)

- Dinkins incorporates basic Spanish medical terminology in PHCY 401 (and continued in PHCY 402)
- Ferreri and Marciniak develop and recruit a PGY2 academic residency to start in 2009
- Ferreri and Scolaro initiate residency mentoring program to start in 2009 with a focus around developing into an academic.
- Ferreri, Marciniak and Scolaro initiate teaching certificate program to start in 2009
- Ferreri was promoted to Clinical Associate Professor in part for her contributions to the teaching mission
- Ferreri incorporates audience response system technology into her Continuing Education presentations
- Ives starts DPPEE writing club to promote and support scholarship through topic discussions and internal peer review of abstracts, posters and manuscripts. In its initial year, there have been approximately 12 participants that meet monthly and the group produced 12 presentations for the 2009 AACP national meeting.
- Ives initiates the use of an electronic data base to documenting faculty contributions to the School's mission.
- Koval develops virtual ambulatory care facility in SecondLife to help students learn patient counseling
- Michalets and Leadon received AACP's Crystal Apple Award which recognizes the contributions pharmacy schools and their practice partners make in successfully conducting and supporting quality experiential education in settings focusing on patient care
- PCL team and Deloatch developed presentation evaluation rubric
- PCL team changed assessment of PHCY 404 OSCE cases-- incorporated "critical components" (key areas to be addressed during patient interaction) that were more heavily weighted
- PCL team develops new OSCE cases for PHCY 404 that focus more on relationship and communication with the patient-- required more empathy and patient interaction
- Raasch receives American College of Clinical Pharmacy teaching award Division revises seminar series to more consistency. Included in this revision is the development of review modules in Blackboard.
- Roberston completes AACP Education Scholar program
- Settlemyer (and Williams) continue to use service-learning in the MTM elective.
- Scolaro created an assessment and feedback system for teaching assistants within PCL.
- Scolaro created the SOAP note primer and worked with PEP and Assessment Committee to design the new SOAP note rubric
- Vaughn incorporates more active learning into her classes

## **MCNP**

- Singleton uses immediate-feedback assessment for examinations within Medicinal Chemistry I
- Singleton named Class of 2011 Instructor of the Year

## DPOP

- Hansen beta-tests web-based, multi-media module in Pharmacy Management. He continues in development the module.
- Roth revised DPOP teaching seminar to include student teaching and updating the Center for Faculty Excellence's *For Your Consideration* teaching resources.

## Appendix I

### REPORT

#### Initiation of Audience Response System

In May 2009, two surveys were released, one for students in the second professional year and one to faculty.

**Summary Statement 1.** Students and faculty had a positive experience with the audience response system. Students found questions that were conceptual or application-based are the most useful. Faculty that used the ARS found the system easy to use and found it better than previous methods to assess student comprehension of material.

**Recommendation 1.** Fully implement the use of the audience response system.

**Summary Statement 2.** The School currently owns an ARS system that is equipped in four rooms within the Chapel Hill Campus and 2 rooms at Elizabeth City State University. The School also owns approximately 300 response devices, enough to supply two professional classes.

**Recommendation 2.** Purchase enough response devices for the first year class. Further develop the current system in assigning response devices to students. Draft a document stating student accountability for loss or damage to the response devices and associated fees.

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## *Student Survey*

### **Total Responses 63 (~42%)**

Q1) Please list what courses you have used the audience response system:

- 12 different courses. Most often cited (in order)
  - PHCY 444 – Cardiology/Nephrology,
  - PHCY 452 – Nonprescription medications
  - PHCY 414 – Applied Pharmacokinetics
  - PHCY 424 – Medicinal Chemistry II

Q2) When responding to the following statements, think about your orientation towards classroom learning in general. (A = agree, SA = somewhat agree, SD = somewhat disagree, D = disagree)

#	Question	A	SA	SD	D
1	I am hesitant to ask questions when I don't understand the material	35	19	7	2
2	I want my instructors to seek feedback from me.	23	31	7	2
3	I am interested in the opinions of my classmates	29	25	8	1
4	I raise my hand in class when the instructor asks for a show of hands	34	19	8	2
5	I'm reluctant to share my opinions in class	22	28	7	6
6	I prefer classes where I have the opportunity to participate	16	27	17	3
7	I like classes where I am not required to participate	16	20	23	4
8	Gaining knowledge is more important to me than the grades I receive	28	30	3	2
9	I prepare more thoroughly when my participation is graded	30	24	6	3

Q3) When responding to the following statements, think about a specific class in which the response devices were used (A = agree, SA = somewhat agree, SD = somewhat disagree, D = disagree)

#	Question	A	SA	SD	D
1	helped increase classes overall value	42	18	3	0
2	helped make the learning experience more enjoyable	49	12	2	0
3	helped me to provide feedback on my instructors teaching	38	18	6	1
4	helped increase my awareness of my peers' opinion and attitudes	43	15	5	0
5	helped me to get individualized feedback from the instructor	20	19	14	10
6	helped the class to move at the right pace for me	34	21	6	2
7	helped motivate me to be more prepared for class	14	28	13	7
8	helped me gauge my understanding of course material	45	17	0	0
9	helped me understand my performance in relation to my peers	46	15	2	0
10	helped me to stay interested during class time	45	17	1	0
11	helped me to focus on key knowledge in the class	45	15	3	0
12	helped make my input an important part of class	29	22	9	3
13	helped me to participate in class	47	16	0	0
14	helped improve small group interaction	19	27	12	5

- Q4) What did you like best and least about how the instructor(s) used the response system in class? (example answers)
- "I liked the way it outlined what we need to focus on and sample exam questions as well as how it kept students engaged."
  - "[It] helped me to understand the concepts better and what point the instructor was trying to get across - it allowed me to focus on more important aspects of the lecture"
  - "[Instructors] were able to see what we were thinking instead of just assuming."

- “It was a great way to gauge my understanding of the material presented in class, and it helped me to focus on what points were the most important.”
- “I liked the way Dr. Dupuis used the response system because he would talk about all of the choices. He would explain why the answers were correct or incorrect.”
- “I liked how it slowed the lecturers down and allowed us to immediately apply the material they were teaching so that we could see whether we had a full understanding of it.”
- “I didn't like it when it was used for questions where the answers were easy or obvious. It was most helpful when it was used to reinforce an important point and when the answer required some thought.”
- “When it was used with cases or at the end as a review/summary”
- “It was best used when incorporated into questions that were structured as patient cases”
- “I did not like that the instructors did not usually give us enough time to key in our answer for the automated response system. Usually, the questions required looking back in the material to find the answer, and most of the time I did not have time to do this before they would "close" it.”

Q5) What suggestions do you have for improving the use of the audience response system? (example answers)

- “Come up with more critical thinking questions instead of questions with answers straight from the notes.”
- “Use it more often”
- “I get the most out of my classes when I'm engaged and participating.”
- “May be audience response can be done to review the material from last class and emphasize the important points before starting a new concept that builds upon the last one.”
- “I think there should be more questions, throughout the lectures”
- “A few professors did not wait long enough for us to answer before they clicked on to the correct answer. They need to remember to allow us time to read the question, read the answer, and reason to our own conclusions. Also, they should address each of the possible answers that students click (even if it is only a small portion of the class to put that answer).”
- “Don't ask simple things that are already on the slides, make us apply the concepts”
- “I think that taking 5-10 minutes of lectures to ask questions really helps to enhance learning. Professors should know that it is important to explain the correct answers instead of just showing the results and saying for example A is the correct answer and then moving on. Explanation makes the clickers successful.”
- “Use it more often but not for foundation knowledge questions, (ie material that requires memorization), but for application questions”

Q6) I have used the audience response system for a class project or presentation:

#	Answer	Response	%
1	Yes and I would use them again	27	43%
2	Yes but I would not use them again	1	2%
3	No but I would consider using them in the future	32	51%
4	No and I would not use them	3	5%

## Faculty Survey

### Total Responses 47

Q1) Did you use the audience responses system this past year?

- Yes 11      No 36

Q2) How many hours did it take you to learn the ARS software to get your class set up?

- Mean = 1.4 hours    SD = 0.8 hours

Q3) How important were the following purposes in your decision to use the audience response system

- Top 3 answers
  - Evaluate class understanding: gauge the class understanding of concepts presented
  - Student participation: encourage students to participate in class
  - Student self-assessment: provide a way for students to get rapid feedback on their knowledge and performance.
- Bottom 3 answers
  - Grading: simply recording and grading in-class quizzes
  - Peer assessment: allow students to rate peer's work.
  - Experiments: conduct in-class experiments

Q4) How often did you use the audience response system in your class?

- Once or twice (4/11) or Regularly but not every class (4/11)

Q5) What portion of class time do you spend using the ARS?

- Small portion (7/11)

Q6) To what extent was it necessary to change the structure and organization of your course to implement the ARS?

- Hardly any change (9/11)

Q7) To what extent did you change the kinds of questions you ask students during class?

- Hardly any changes (7/11)
- A fair amount (4/11)

Q8) How important are the following types of questions for assessing student understanding in your class? (# reporting extremely important)

- Recalling facts (1/11)
- Applying concepts (7/11)
- Sharing opinions (1/11)

Q9) How did using the ARS impact your course compared to previous semesters? (# responding improved or much improved)

- Recalling facts (6/11)
- Applying concepts (9/11)
- Sharing opinions (6/9)

Q10) Overall it was worth the effort to use the ARS?

- Strongly Agree (10/11)
- Agree (1/11)

Q11) I would favor full implementation of the ARS?

- Yes = 91% (42/46)

## Appendix II

### REPORT

#### Implementation of Small Group Activity and Module Development in PHCY 413: Foundations in Pharmacokinetics

Adam M. Persky, PhD, Course Coordinator  
Gary M. Pollack, PhD, Course Instructor

**Summary Statement 1.** Students are able to learn foundational knowledge on their own given appropriate instructional materials (instructor-developed material, formative quizzes, problem sets). There is no evidence that linear multi-media learning environments are superior to instructor-developed, static material (e.g., e-book) nor is there evidence that students prefer technology based content delivery to that of reading. The feeling that the e-book was more efficient is in line with the literature about reading being more efficient than lecture, even if it's an e-lecture.

**Recommendation 1.** Technology-based projects are only worth using when it addresses a specific instructional deficit. According to the results here, technology based projects should be limited due high resources required and no apparent functional difference or preference compared to other non-technological instructor-developed material. As such, technology-based projects could be pursued in areas where we have instructional deficits as defined as lack expertise or where multiple courses could benefit from their use (e.g, pathophysiology, pharmacology). These technology-based projects should be mixed format, potentially being more of an e-book with animations to support more difficulty concepts than complete course revisions.

**Summary Statement 2.** Students prefer small group format compared to the traditional large class and prefer these small group sessions to be more structured activities than a more Socratic discussion.

**Recommendation 2.** While transforming large classes into smaller sections is an appealing option, considerations have to be made to: classroom space and potential instructor work-load and lack of enthusiasm due to repetitive nature of these smaller sections. If more than one instructor leads a section care needs to be taken to offer similar experiences. These smaller classes should probably be focused around a structured activity; this will be especially true for younger students.

**Summary Statement 3.** There are several issues that were encountered during the development of the module. The first is time to develop. This project is resources intensive and over the course of the project it is easy to lose motivation. In the approximate time it has taken to build the module, several text books could have been written. For example, the e-book was written and revised in a shorter time period than it took to develop the module. The other issue is that there is an inherent risk that building a module that is meant to replace class-time as this is essentially what online classes are intended to do. Although student attendance ranged from 50 to 90% throughout the semester, students may not see class time as immediately important to their success though it might be later in their academic career.

**Recommendation 3.** Do not use technology to transform entire courses unless necessary, target parts of classes with the largest instructional deficit and sections of courses that will have the largest value added by added technology. Other instructional

activities can be developed with the time that would be invested to more actively engage students. If technology projects are pursued, then course objectives, practices, quizzes, and even scripts should be done up front to help streamline the process

**Summary Statement 4.** The transition to more student-responsibility in learning requires instructors to become increasingly aware of how to optimize learning outside the classroom and how to use in-class time to in a more active way.

**Recommendation 4.** Faculty development is needed to assist faculty in making a transition to more interactive courses. There is no substitute for a well-prepared instructor

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**Background:** Starting in 2004, there has been an increased emphasis of active learning within PHCY 413. The active learning was accomplished mostly through active lecture techniques. Approximately 80 to 85% of class time was spent on foundational knowledge and comprehension. Class time was supported outside of class by an instructor-developed e-book and problem sets. In 2006, several learning activities were added. Reflective writing assignments were implemented to help students relate their new knowledge to pre-existing knowledge and to provide formative feedback regarding instruction. Immediate feedback examinations were added to assist students to enhance their problem-solving skills. Finally, multi-media learning

environment was piloted for the hepatic clearance section of the course. The goal of this module was to help off-set class content to outside of class so that class time can be used to help students achieve higher order learning (e.g., application, analysis, evaluation).

**Table 1: Comparison of pre- and post-quiz for students who attended class (in-class) or completed the module (module).** \*  $p < 0.01$  compared to pre-quiz

	Pre-Quiz			Post-Quiz		
	Median	25%	75%	Median	25%	75%
In Class	4.0	3.0	5.0	6.0 *	4.3	6.0
Module	3.0	2.8	4.3	5.0 *	4.0	6.0

**Pilot Project:** In a pre- post-test design it was demonstrated the module could delivery content knowledge similarly to that of a live interactive lecture (Table 1). Following these results, the remainder of the course was incorporated into this multimedia environment.

**Scale-Up:** In 2007, the majority of the course (>90%) moved from a class format of meeting three times a week for one-hour with all students (N~150), to a meeting once a week for an hour with approximately 50 students per class. This structural change was made so that students could use available resources (e-book or the module) to acquire basic content knowledge outside of class and use class time for the achievement of higher order learning.

During the 2007 year approximately 30% (2 out of 9 sections complete) of the module was complete thus students could use the module for a small fraction of the class but could use the e-book for the remaining part. In 2008, the same structural format was used except the students had access to approximately 67% (6 out of 9) of the module. Table 2 shows the breakdown of examination question based on level of learning. Consistent with curricular mapping efforts, questions were separated into three levels: level 1 (knowledge/comprehension); level 2 (application/analysis); level 3 (evaluation/synthesis). As most of the objectives of the course focuses on the application and analysis of pharmacokinetics and pharmacodynamics, the majority of examination questions assessed this level of learning. Regardless of course format,

there was no difference in scores between years, though there is a difference that questions assessing higher order learning scored lower than the lower levels (Table 2).

**Table 2: Comparison of levels of learning.**

	2006		2007		2008	
	N (%)	Mean (SD)	N (%)	Mean (SD)	N (%)	Mean (SD)
Level 1	33 (31)	4.62 (0.39)	15 (15)	4.72 (0.17)	13 (16)	4.79 (0.25)
Level 2	58 (55)	4.49 (0.59)	76 (74)	4.41 (0.53)	60 (73)	4.51 (0.51)
Level 3	14 (13)	3.79 (0.73)	12 (12)	3.78 (0.76)	9 (11)	3.86 (0.99)

Attitudinal surveys were used to collect information about how students perceived the course. In general, the attitudinal surveys were consistent with the students' reflective writing statements. The results from the surveys can be found in Table 4. Summarizing the results, students prefer the small group format to the traditional large class format. They felt they gained on their learning but did not feel they missed out on instructor contact time. In fact, the data suggest that students felt they gained on quality of instructor-student time. Students also tended to prefer the e-book to the module with the most often cited reasons being the book were easier to self-pace, quicker to go through and students liked marking the text. The most common reported advantage of the module was it appealed to more visual learners and complemented the book well. Although there was a preference for the instructor-developed book, the majority of students used both resources. This may have contributed to the students feeling that they had flexibility in their learning. Students felt that they did not spend any more or less time on this course than others, possibly because they only had to come to class once a week despite learning most of the content on their own time. Interestingly, students felt that they should spend 3 to 4 hours a week preparing for any individual class and when asked to report how much time they spent, the range was similar. Students' also felt the course helped them manage their time and acquire problem solving skills. The goal of offsetting content and using class time to help students apply their knowledge – while class time was used to discuss issues that normally can't be discussed under normal lecture conditions, students felt weakly that coming to class was necessary to be successful in the course. Although students felt coming to class was not necessary for success in the course, it does not mean they may not benefit from attendance. Class attendance may assist them in later courses because class discussions did relate to topics they would see in practice and later in the curriculum (e.g., dosing of individual agents, dialysis, issues related to therapeutic drug monitoring)

**Development Process:** As for the actual building of the module this was a 2.5 year project at an approximate cost of \$300,000. While the most dedicated effort was given, it was difficult to maintain enthusiasm for that length of time.

**Table 3: Faculty Time Investment to Develop a Module.** Based on the experiences in developing the Foundations in Pharmacokinetics modules (from January 2006 to December 2008), the approximate investment of time to develop a one-hour module is found below. Times indicate the amount of time the instructors spent on developing the module and not the time spent on the information technology side.

Start Time	Jan 2006
Estimated Completion Time	Feb 2009 *
Estimated run time of module	17 hours
	<b>Number Used</b>
Faculty	2
Graduate Students	1
<b>Task</b>	<b>Time Needed for a 1 hr module per instructor (in hrs)</b>
Draft a script**	8 – 12 (median 10)
Revise storyboard/Clarify script	6 – 8 (median 7)
Storyboard read through	2 – 5 (median 3)
Animation Review	5 – 10 (median 7)
Writing Practices/Quizzes	8 – 18 (median 12)
Miscellaneous (e.g., providing ad lib information)	5 – 15 (median (10)
<b>Total (for 1 h module)</b>	<b>34 – 68 (median 49)</b>
* denotes initial development from scratch and proof of feasibility (October 2007)	
** does not include writing of objectives	

**Table 4: End of Semester Survey Summed from 2007 & 2008.** Data represent number of students responding

		Small		neutral		Large
1	What is your preference for class time, large groups like you have had in other classes or small groups? 1 = Preference for large group, 5 preference for small group	93	82	50	22	29
		<b>less</b>		<b>neutral</b>		<b>more</b>
2	During the small group activity, do you prefer less structured activities (e.g., discussions where the instructor asks questions) or more structured activities (e.g., cases completed in groups)? 1 = Preference for more structure, 5 preference for less structure	18	31	30	95	100
		<b>e-book</b>		<b>neutral</b>		<b>module</b>
3	What is your preference for pre-class time preparation, self-paced module or e-book? 1 = Preference for module, 5 preference for e-book	109	49	56	19	41
		<b>more</b>		<b>same</b>		<b>less</b>
4	Comparing class formats, how would you rank the amount of time you spend studying/preparing for this class format compared to if this class was a traditional large group lecture format?	45	66	122	33	10
		A) Use the book only				69
		B) Use the Module only				3
5	For the material in the course, did you:	C) Use the book first, then the module				129
		D) Use the module first, then the book				71
		E) Used neither resource				1
6	On a scale of 1 (not very) through 10 (very), how comfortable are you learning on your own (through reading or the modules)? *	7.5 (SD 1.8)				
		<b>SA</b>	<b>A</b>	<b>N</b>	<b>D</b>	<b>SD</b>
7	In the current format, in order to be successful (i.e., really understand the material), coming to class is essential	25	85	67	62	32
8	I feel I missed out on instructor contact because of the format of the class	13	40	48	76	93
9	I feel I missed out on learning because of the format of the class	11	30	53	82	93
10	I feel I gained on learning because of the format of the class	39	97	71	40	16
11	I feel the contact time with the instructor was of better-quality in the small group format than the traditional large group format? **	53	56	17	7	1
12	I feel like I have a choice over how I am going to learn in this course *	82	42	10	2	1
13	This course has sharpened my analytical/problem solving skills *	62	60	11	3	0
14	I feel more confident about tackling unfamiliar problems *	47	61	24	3	0
15	This course has helped me develop the ability to plan my own work *	58	54	10	4	1
16	Approximately how much time per week do you spend preparing for class? (in hours) *	3.1 (SD 2.0)				
17	In your opinion, how much time per week should a student spend preparing for an individual class? *	3.9 (SD 2.0)				

SA = Strongly Agree; A = agree; N = neutral, D = disagree, SD = strongly disagree, U = unsure; \* data reported as mean (standard deviation)  
 \*\* only asked in 2008

