Integrating General and Professional Education through a Study of Herbal Products: An Intercollegiate Collaboration1

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To prepare students to practice pharmaceutical care, pharmacy schools must ground professional study within general education. Accordingly, an interdisciplinary faculty team from different pharmacy schools collaborated to integrate the teaching of general and professional abilities through a study of herbal products. St. Louis students in Critical Thinking and Writing and Albany students in Natural Products employed inexpensive electronic technology to collaborate on projects related to Internet advertising of herbals; the purpose was to improve their thinking, communication, and ethical decision-making abilities within a context of professional study. Using an ability-outcomes approach, the instructors identified what students needed to do; employed strategies that required practice of abilities in a sequence of increasingly complex assignments; created criteria to guide practice; and provided extensive feedback. Portfolios, surveys, testing, and course evaluations indicate students improved the targeted abilities. The collaboration broadened student perspectives and enabled them to practice general and professional abilities within contemporary, relevant contexts.

General education is to be had, I am saying, anywhere in the college curriculum, whether the discipline in question is traditionally liberal or frankly professional—as long as the instructor plans carefully not just the substantive information she is imparting, but the qualities of complex reasoning, and the subtle contexts of culture and value, that she is also presenting.

Linda Salomon, 1985

In 1985, when Linda Salamon, then dean of the College of Arts and Sciences at Washington University, spoke these words at an AACP General Session in San Francisco, there was a flurry of activity to establish what the Association of American Colleges (AAC) called “integrity in the college curriculum,” with “integrity” referring to “wholeness.”(1) Salamon specifically urged this integrity or wholeness for the pharmacy curriculum, a healing of the bifurcation of liberal and professional studies. This theme is echoed in the Report of the Professional Preparation Network, Strengthening the Ties that Bind: Integrating Undergraduate Liberal and Professional Study(2), which proposed common ability outcomes for professional and liberal education. And The Liberal Art of Science: Agenda for Action recommended a science pedagogy that emphasized not simply mastery of content but educational experiences that clarified: (i) the nature of scientific understanding; (ii) integrative concepts such as scale and proportion or change and evolution; and (iii) the historical, ethical, social, economic, and political contexts of science(3).

The idea that professional education should be situated within general education is not an end-of-the-millennium fad. It goes back to at least 1868 when Edward Parrish argued:

The very first thing after good moral principle in a young man is a liberal education. When we start to improve our profession, let us begin by insisting on a better preliminary education, the basis not only of success in pharmaceutical education, but the basis for success in life.(4)

And the exhortations continue through the 1999 address of AACP President-Elect Robert E. Smith, who charged the Academic Affairs Committee to “suggest ways to strengthen the academy’s support for their [the general outcomes and abilities’] incorporation into our pharmacy curricula.”(5)

Implicit in these several recommendations is the recognition that what distinguishes education from training, a profession from a trade, is, partly, inquiry, analysis, judgment, and ethical decision-making—all of which are sometimes subsumed under the rubric of “critical thinking.” What is more modern perhaps is the proposition that general education should not be antecedent to or concurrent with professional education, but integrated into it.

Over the past fifteen years colleges of pharmacy have responded to the recommendations of educational associations such as AAC and AACP (particularly through its Commission to Implement Change in Pharmaceutical Education1 and the Focus Group for Liberalization of the Professional Curriculum(6,7), to develop within professional education

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Received July 31, 1999, accepted September 10, 1999.
pedagogies that incorporate ability-based assessment, critical thinking, and active learning. But despite many groundbreaking efforts and remarkable and even inspirational successes across the country, it is questionable that this integration of professional and general education is the norm in most schools of pharmacy. In an era of mushrooming knowledge that threatens a tyranny of content, it is difficult to answer, in a re-assuring way, these questions asked by Salamon:

Do you teach students not facts but the power to establish facts, to bring them together as evidence, to probe the apparent results, to let imagination and even intuition play over them? Do you let students draw their own conclusions, including (on occasion) false ones? And in your professional studies, do you strengthen those critical and analytic powers and invite students to make their own synthesses? Or just to accept yours? Do you reveal to them how little we know about drug action? How often new discoveries prove our assumptions wrong?

What is being advocated here is a constructivist, cognitive approach to teaching that makes students’ intellectual development central to their education. Such an approach does not depreciate the value of content but heightens it, for an extensive database of knowledge is essential not only for pharmacy practice but also for increasing maturity in thinking—for instance, for developing along Bloom’s taxonomy from recognition and comprehension through synthesis and evaluation.(8) But if content alone shapes a pharmacy curriculum, students will find it more difficult to progress through the stages of intellectual development that William Perry identifies within a successful college experience: “dualism” (answers are all unambiguous and clear cut); “multiplicity” (all answers are equally valid); “relativism” (mutually-agreed upon criteria distinguish better and worse answers); and “commitment” (willingness to take responsibility for the construction of a worldview)(9).

In short, students who are to become critical, independent learners must realize that knowledge is context-dependent, and they must learn how to evaluate competing knowledge claims through carefully monitored, criteria-based judgments. These abilities are core outcomes of a general education. Courses and curricula that encourage students to develop such abilities while imparting pharmacy-related content will best prepare pharmacy professionals for an unpredictable future.

A subject matter that is particularly fruitful for integrating general and professional outcomes is complementary and alternative medicine (CAM): a rigorously-trained mind is required to distinguish in the voluminous literature what is scientific fact from what is inference and empirical observation. The perceived pseudoscientific nature of some alternative therapies has influenced some practitioners and academicians to argue against the inclusion of formal CAM instruction in medical and pharmacy curricula. Proponents, on the other hand, justify the alternative is to avoid discussing therapies used by 42 percent of the population. . . . We agree that physicians must be responsible for evaluating these therapies and helping the patient distinguish the useful from the useless. This is the reason we strongly recommend that students be taught to critically read and evaluate the research literature(12).

Similar discussions have occurred within pharmacy education: should CAM be taught within a professional pharmacy curriculum, and if so, how? Some suggestions have been given in sessions at recent AACP annual meetings (1998: “Teaching Herbal Medicine,” and “Herbs and Herbal Medicine”; 1999: “Alternative and Complementary Therapies in the Pharmaceutical Curriculum,” “Placebos and the Placebo Effect,” and “Alternative Therapies”) and in a booklet distributed to all 1999 Annual Meeting participants in which AACP describes alternative therapy programs at twenty-seven schools of pharmacy so as to “stimulate faculty to begin the difficult task of answering the important questions related to safety, efficacy, and standards of alternative therapies.”(13) Our interest is focused on a subset of CAM, specifically the use of herbal products as medicines. Increasingly, pharmacists will be asked to help select/recommend herbal products and counsel patients regarding use. Some herbals have great potential for optimizing patient outcomes, but because they are not regulated by the FDA and because the inability to patent herbals discourages extensive clinical testing, herbals pose problems that the pharmacist and patient do not encounter with regulated drugs(14).

The issue is how to teach students to counsel patients about herbal products, providing answers that involve a complex web of scientific, ethical, legal, and cultural matters that need to be evaluated within the framework of individual situations.

What is particularly challenging for a pharmacist is the need to assess the claims (scientific and commercial) made about herbal products and to interact with a population “educated” by sales persons, manufacturers, and anyone who has the ability to post information on the Internet—with little interference from the FTC or FDA. A proliferation of unregulated medical information on the Internet and the direct marketing of medical products and services to consumers present challenges throughout the health sciences(15), but the phenomenal, concurrent and perhaps interdependent growth of herbs and the Internet has resulted in a multitude of speculative and unsubstantiated claims for herbal products(16). It is imperative that practitioners in some health care profession be trained to recognize and analyze claims, evaluate sources, and communicate effectively with patients who do not have the pharmacological background to sort through and evaluate the therapeutic promises that they may be predisposed, desperately, to believe. What follows is a description of an interdisciplinary project that explicitly and systematically attempted to teach the general ability outcomes of critical thinking, communication, and ethical decision-making within the context of pharmacy educa-
tion, here specifically dealing with the complexity of issues involving herbal products.

METHODS

In Spring, 1997, Deanne Nowak (medicinal chemistry) met with Thomas Zlatic (English) from St. Louis College of Pharmacy to discuss the implementation of an ability-based instructional approach in an Introduction to Natural Products (NP) course she had taught at Albany College of Pharmacy. The discussions sparked a creative energy, and Diane Sylvester (pharmacologist at Albany) was enlisted to co-teach a revised version of the NP course. Further brainstorming led to a proposal to include Zlatic as an NP instructor and to link the NP course with the Critical Thinking and Writing (CTW) course that he was teaching at St. Louis.

The purposes of the project were to stress critical thinking, communication, and ethical decision-making abilities within pharmacy contexts and to give greater relevance and currency to course materials. This attempt to integrate general and professional ability outcomes was driven by the principles and methods of ability-based education, and it required adoption of multiple active-learning strategies. The related attempt to develop strategies and activities for collaboration for the achievement of student ability outcomes across courses, curricular years, and colleges in different states also necessitated experimentation with electronic communications and distance learning.

Introduction to Natural Products

Focusing on the top twenty-five best-selling natural products, the NP course teaches students to critically evaluate the safety and efficacy of these compounds from a scientific perspective, and to analyze ethical issues and values relating to their advertisement, sale, regulation, and recommendation. It is an elective course open to students in their first or second professional year (third or fourth college year).

The NP course was taught for the first time in the Spring of 1997. The intended outcomes were similar to those of the current iteration, but the objectives did not give a clear picture of what was expected of the students, and the implementation fell short. Students were expected to demonstrate the ability to think critically via completion of a culminating class project and though some students did this successfully, it was impossible to demonstrate a causal connection with course-related activities.

Scrutiny of the pedagogical methods revealed that students were exposed to critical thinking only through instructor modeling; the course materials were presented in lecture format. Without any further instruction or practice opportunities, students were expected to demonstrate the ability to critically analyze herbal product information derived from the Internet as part of the semester-long research project which was assessed summatively, by the instructor, with no opportunity for student revision. The Internet was used solely as a source of information for the projects and collaborative efforts among students were restricted to limited pair interaction in completing some project components. Self and peer assessment strategies were not implemented at all in the original course.

The Albany College of Pharmacy instructors had had no previous experience with ability-based education but were aware of the concept and anxious to try it. This collaborative project established a mentoring relationship among the instructors that facilitated a tighter focus on the development and assessment of critical thinking within the NP course, and led to the incorporation of ethical decision-making as an ability outcome. In the revised NP course in which five students enrolled, the number of herbals presented was reduced considerably in order to promote analytical skills through in-depth coverage of fewer topics(17). Active learning was incorporated into every class period and the students were given multiple opportunities to practice skills under development. Tests and quizzes were eliminated; grades were based instead on papers, homework assignments, and in-class activities. Interaction among students and faculty was enhanced, as was use of electronic technology. Formative self, peer, and expert assessment strategies were incorporated, and students were allowed to submit multiple revisions.

Critical Thinking and Writing

Critical Thinking and Writing is a required, first college-year course that stresses thinking, communication, and research skills that will enable students to write effective persuasive essays, critiques, syntheses, and research papers. Emphasis is placed on analysis, synthesis, and evaluation of arguments, particularly ones clarifying personal values and ethics. Prior to this innovation, CTW had been taught as an ability-based course. While the course entailed computer instruction, it did not involve the Internet or electronic bulletin boards, both of which the instructor desired to incorporate since sharing of student ideas through electronic bulletin boards was thought to have the potential to enhance the development and critiques of arguments. The previous CTW course did require a term paper so that students could learn the basics of research, literature evaluation, and documentation, but frequently the topics for the essays held little interest for the students and thus student effort was often merely pro forma.

The collaboration motivated the CTW course to expand to include the Internet as a source of critical thinking material and a subject of critical analysis. In this course with eight students, greater emphasis was placed upon revision, and students were given multiple opportunities to improve their performance based upon peer, self, and instructor feedback. The expertise of the NP faculty regarding herbal products allowed the course to incorporate research on pharmacy-related topics so that the students could practice general abilities within professional contexts at a very early stage in the curriculum(18).

Structure of the Courses and Electronic Interaction

Collaboration between faculty and students separated by a thousand miles prompted experimentation with distance learning. Electronic media used to close the spatial gap included Internet web pages, an electronic bulletin board, e-mail, instant messaging, videotaping, and telephone.

All three instructors team-taught the NP course, with the two Albany instructors being responsible for the majority of the course; the St. Louis instructor visited Albany for the equivalent of two weeks to conduct classes on critical thinking and ethics. The Albany instructors used a speaker phone to transmit classes back to St. Louis; the posting of course notes/assignments on the Internet made it easier for the St. Louis instructor to participate in the NP class. The instructor from St. Louis also prepared an interactive videotape on ethics with Internet material that was viewed by the NP students. A similar video accompanied by written assignments was prepared for the CTW students so that class time wouldn’t be lost during his visits to Albany. On occasion, science and humanities professors from Albany participated in class discussions.

The NP instructors participated in the CTW course by pro-
viding expert knowledge and feedback regarding the pharmacology and regulation of herbal products. Materials generated in the NP course were transmitted to the CTW instructor for incorporation into his course. The NP instructors reviewed the work of CTW students and provided tutoring and expert feedback. Faculty and students at the two colleges communicated via electronic bulletin board, e-mail, and instant messaging.

In some cases, students at the two colleges shared joint assignments; at other times they participated in parallel but separate activities, particularly those focusing on argument analysis, ethical analysis, and analysis of herbal product advertising on the Internet. The NP students became mentors for the CTW students regarding herbal medications while the CTW students served as a lay audience to evaluate monographs written by the NP students.

What particularly enabled the collaboration between the two schools was the discovery of a free, pre-packaged, course web page, Nicenet(19). Nicenet, sponsored by a non-profit corporation in the Silicon Valley, resides on the developers’ server. Using Nicenet, faculty with minimal Internet knowledge can create course web pages that include a schedule of course activities, course materials such as the syllabus, links to web pages that supplement text books, an electronic bulletin board by which students can explore ideas together, and an e-mail system. Similarly, students with minimal computer skills can quickly learn to use the functions of Nicenet. It is an ideal product for use in courses in which computer technology is a tool rather than a focus of study.

Separate course web pages were created on Nicenet for NP and CTW. In addition, another course web page, the “Collaboration” page, was created using Nicenet so that students from the two courses could communicate with each other through electronic bulletin boards and e-mail. Finally, web pages were created for each course on the respective school servers to post graphics and other materials not easily handled by Nicenet and to provide public access to course information since Nicenet is accessible only by password.

Students in both courses participated in joint learning activities on the bulletin board on the “Collaboration” page. For example, the CTW students posted their reasons pharmacy students should or shouldn’t work during the school year; then they posted counter-arguments to others who had opposing viewpoints. Based on the interchange, the CTW students then wrote argumentative essays on the topic and posted them on the bulletin board so they could be peer reviewed by the NP students; the goal was for the CTW students to improve their writing and for the NP students to develop analytical skills. The two sets of students exchanged ideas via e-mail, copying the instructors on all exchanges. The CTW student then revised their essays, based upon self, peer, and expert assessment and posted them once again to the bulletin board.

The electronic bulletin board was also a vehicle to develop skills in ethical analysis. Students from the two colleges were put on teams to decide upon the ethical issues involved in selling cigarettes in pharmacies. Through e-mail the team members exchanged ideas and eventually arrived at a well-reasoned consensus about what should be done. These conclusions were posted on the bulletin board. If consensus could not be reached, individuals could post disclaimers (see Figure 1).

E-mail proved to be an extremely effective pedagogical tool with many uses both within and between courses. It enabled quick, personalized assessment feedback to students; for instance, students writing or rewriting essays could e-mail their thesis statements or outlines to the instructors and get sometimes instant advice about how to proceed. E-mail also allowed instructors to provide encouragement and praise to students, and served as a means for keeping students on track in case an assignment was missing or a student missed a class. Students used e-mail to keep the instructors informed when they had problems or excuses, and they could ask questions about unclear topics. In some cases, e-mail provided a forum for extended discussions of topics raised in class. And of course e-mail was indispensable for communication between faculty and students at the two colleges, enabling also peer assessment between schools. As a way of building interest and rapport with students, instructors used e-mail to send recreational “quizzes” to students—critical thinking riddles that caused the solver to re-think assumptions, and questions involving interesting facts about herbal products, such as, “What caused Cleopatra to reject strychnine as a suicide agent?” Finally, e-mail was an effective means for housekeeping, letting students know about changes in schedules or meeting locations.

ABILITY-BASED APPROACH

Ability-based educational strategies provided the glue to bind the two courses. For both courses the instructors worked closely to: (i) create clearly defined ability outcomes; (ii) provide multiple opportunities for students to practice each outcome; (iii) create clear criteria so that students could understand what good practice of the ability entailed; and (iv) assessment feedback so students could improve their performance in subsequent practice(20). Emphasis was placed on assessment as learning. Through a series of structured self, peer, and expert assessments, students learned what constituted each ability and devised strategies to become more proficient at each.
Thus, although CTW and NP shared the ability outcomes of the course, to course content, and to the level of the students, ability outcomes must be made specific to the particular goals of vehicle (see Figure 2). However, in ability-based education, the outcomes are what drive the content, teaching strategies, sequencing, assignments, and assessments within a course. The purpose for the innovations in these two courses was to enhance the possibilities that students would better achieve general ability outcomes in thinking, communication, ethics, and (in the case of CTW), self learning while learning content in the professional area, that is, to practice specific abilities at higher cognitive levels—for example, “Evaluate the safety of natural products based upon reported experimental and empirical data.” Though in the earlier iteration of the course students probably did operate at

<table>
<thead>
<tr>
<th>Table I. Course abilities and associated criteria</th>
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</thead>
<tbody>
<tr>
<td><strong>Critical thinking and writing</strong></td>
<td><strong>Introduction to natural products</strong></td>
</tr>
<tr>
<td><strong>Critical Thinking</strong></td>
<td><strong>Critical Thinking</strong></td>
</tr>
<tr>
<td>I. Read and Think Critically</td>
<td>I. Find, comprehend, analyze, and evaluate information relating to the top twenty-five natural products.</td>
</tr>
<tr>
<td>A. Analyze arguments/tests</td>
<td>A. Structural Classification</td>
</tr>
<tr>
<td>2. Identify relationships between premises and conclusions</td>
<td>2. Predict pharmacological activity of natural products based upon chemical structure.</td>
</tr>
<tr>
<td>4. Recognize assumptions</td>
<td>4. Evaluate the safety of natural products based upon reported experimental and empirical data.</td>
</tr>
<tr>
<td>B. Evaluate arguments and college level tests</td>
<td></td>
</tr>
<tr>
<td>1. Assess accuracy</td>
<td>C. Efficacy</td>
</tr>
<tr>
<td>2. Assess fairness</td>
<td>1. Identify dosing problems associated with the use of non-standard, non-regulated natural products.</td>
</tr>
<tr>
<td>3. Assess logical validity</td>
<td>2. Analyze the efficacy of natural products with respect to dosage form and chemical stability.</td>
</tr>
<tr>
<td>C. Synthesize ideas</td>
<td>4. Evaluate the efficacy of natural products based upon reported experimental and empirical data.</td>
</tr>
<tr>
<td>1. Retrieve information from a variety of sources, comprehend it, evaluate it, and create a new idea or text.</td>
<td></td>
</tr>
<tr>
<td><strong>Communication</strong></td>
<td><strong>Communication</strong></td>
</tr>
<tr>
<td>A. Write with a mature style that adapts diction, sentence structure, and tone to the intended purpose and audience.</td>
<td>A. Read with comprehension written text and graphic materials relating to herbal products.</td>
</tr>
<tr>
<td>B. Write critiques that analyze and evaluate other texts.</td>
<td>B. Educate lay audiences about natural products using both oral and written modalities.</td>
</tr>
<tr>
<td>C. Adapt communication to different audiences in order to persuade.</td>
<td>C. Collaborate effectively with fellow pharmacy students.</td>
</tr>
<tr>
<td>D. Write clearly reasoned argumentative essays.</td>
<td></td>
</tr>
<tr>
<td>E. Conduct library research and present the results using appropriate conventions and format.</td>
<td></td>
</tr>
<tr>
<td>F. Use computer technology to assist in locating information, organizing information, and publishing findings on the Internet.</td>
<td></td>
</tr>
<tr>
<td><strong>Ethics/Values</strong></td>
<td><strong>Ethics/Values</strong></td>
</tr>
<tr>
<td>A. Identify major ethical approaches and principles.</td>
<td>A. Identify and analyze values that influence decisions regarding the purchase and use of natural products.</td>
</tr>
<tr>
<td>B. Construct and analyze ethical arguments.</td>
<td>B. Identify, analyze, and evaluate ethical issues related to the advertising, sale, and regulation of herbal products.</td>
</tr>
<tr>
<td><strong>Self learning</strong></td>
<td>C. Identify and analyze values and ethical issues relating to the scientific investigation of drug products.</td>
</tr>
<tr>
<td>A. Formulate strategies to address course ability outcomes in need of refinement or remediation.</td>
<td></td>
</tr>
<tr>
<td>B. Initiate action to correct identified learning deficiencies related to abilities.</td>
<td></td>
</tr>
</tbody>
</table>

Identifying Ability Outcomes

In ability-based education, the outcomes are what drive the content, teaching strategies, sequencing, assignments, and assessments within a course. The purpose for the innovations in these two courses was to enhance the possibilities that students would better achieve general ability outcomes in thinking, communication, ethics, and (in the case of CTW), self learning while learning content in the professional area, that is, to be better able to begin to “think pharmacologically” and “communicate pharmacologically,” using herbal products as a vehicle (see Figure 2). However, in ability-based education, the ability outcomes must be made specific to the particular goals of the course, to course content, and to the level of the students. Thus, although CTW and NP shared the ability outcomes of thinking, communication, and ethics, each course addressed distinct goals within each ability (Table I).
more sophisticated levels of thinking, the course activities were not explicitly focused for them to do so.

Practice Opportunities
In order to develop abilities, students must practice them. Lecture continued to be a part of each course, but it was necessary to create a variety of student active learning experiences. For each ability outcome, therefore, a series of practice opportunities was devised. Over the semester, students were given a number of formal and informal assignments related to each ability outcome and were provided formative assessment feedback from self, peers, and instructors. (Tables II and III contain examples of course activities that support selected abilities, the type of assessment used to evaluate performance of the ability,

![Table II. Sample thinking practice opportunities in NP (Evaluation)](image)

Fig. 3. Ethics practice opportunities over the semester.

and the media used.) These activities and related assessments were sequenced so that the practices could become more complex and the abilities could be integrated as the semester progressed, particularly through culminating research projects in each course (see Figure 3 for an example for ethics).

Students in both courses had been given practice in argument analysis, particularly in the Toulmin method that emphasizes identification of assumptions and evidence for one’s own and others’ arguments. In class, (which met at least once a week in a computer lab) students explored fake web pages designed to appear authentic to catch uncritical readers; found information explaining propaganda, advertising, and argumentation; and located sites that provide criteria for web analysis. Armed with factual information regarding their assigned herbal products, students applied what they had learned about argumentation, logical fallacies, and propaganda devices to an analysis of web sites, using specific criteria by which to evaluate web pages. Initially, students were walked through the web site evaluation criteria and their application to herbal products. CTW students completed analysis sheets of herbal products advertising sites, which had been previously analyzed by the NP instructors and students. The instructors provided expert feedback.

During the semester NP students learned to analyze and evaluate the validity of many published reports dealing with in vitro, animal, and clinical studies on natural products. Faculty and students compared conflicting studies to identify flaws in experimental design, and students were called upon to suggest experiments that would address the discrepancies. They evaluated herbal products in terms of authenticity, compositional uniformity, stability, safety, and efficacy.

Practice of ability outcomes required by the NP and CTW
research projects was incremental. In one of the first exercises NP students were simply asked to identify claims found in herbal product ads. Next they were asked to look for data to support the claims, categorize the data, and assess its credibility. As time went on the activities became more complex; students were required to identify hypotheses from experiments, analyze procedures, and evaluate conclusions. In-class case studies and daily critiques of clinical and/or laboratory data prepared students for evaluation of safety/efficacy claims. Formative exercises required identification, interpretation, and evaluation of claims, but by the end of the semester NP students were expected to gather, analyze, interpret, and evaluate the information on their own and then communicate clear and concise results orally and in writing.

Ethical theories and the components of ethical decision making also had been presented in both NP and CTW over the course of the semester. Initially instruction was provided about ethical theories such as utilitarianism and deontology, and principles such as autonomy, nonmaleficence and beneficence. Subsequently students applied these concepts to general situations and then more specific cases involving herbal products. The exercises involved bulletin board collaboration; analysis of ethical arguments; interactive videotapes; and analysis of cases posted on the web.

Of course in the CTW class writing was practiced continually throughout the semester as students wrote summaries, critiques, and research essays; self and peer assessed written work; and revised their writing in light of self, peer, and expert feedback. The NP course similarly employed a series of writing assignments and an iterative system of revision and assessment feedback.

In each course, a culminating major project required students to integrate most of the course ability outcomes. Both CTW and NP required separate but over-lapping term research

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**Table III. Communication practice opportunities in CTW**

<table>
<thead>
<tr>
<th>Ability outcomes</th>
<th>Days</th>
<th>Practice opportunities</th>
<th>Assessment</th>
<th>Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Write critiques</td>
<td>21</td>
<td>WRITE CRITIQUE of essay on sexual harassment and self assess</td>
<td>S, P, I</td>
<td>Pt</td>
</tr>
<tr>
<td>that analyze</td>
<td>22</td>
<td>Per assess one critique</td>
<td>S, P, I</td>
<td>Pt</td>
</tr>
<tr>
<td>and evaluate</td>
<td>24</td>
<td>REWRITE critique, following peer and instructor assessment</td>
<td>S, I</td>
<td>Pt</td>
</tr>
<tr>
<td>other texts.</td>
<td>35</td>
<td>PROJECT: Write Web evaluation</td>
<td>S, P, I</td>
<td>Pt</td>
</tr>
<tr>
<td></td>
<td>43</td>
<td>PROJECT: REVISE web evaluation following assessment</td>
<td>S, I</td>
<td>Pt</td>
</tr>
<tr>
<td>Adapt</td>
<td>5</td>
<td>Analyze audiences for two versions of a petition for a math waiver</td>
<td>Group</td>
<td>Pt</td>
</tr>
<tr>
<td>communication</td>
<td>15</td>
<td>Compare the use of ethos on two essays on re-cycling</td>
<td>Group</td>
<td>Pt</td>
</tr>
<tr>
<td>to different audiences in order to persuade.</td>
<td>30</td>
<td>Complete class exercises on ethos and pathos</td>
<td>Group</td>
<td>Pt</td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>Complete class exercises on accommodating audiences</td>
<td>Group</td>
<td>Pt</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>WRITE PERSUASION introduction on a campus issue</td>
<td>P, I</td>
<td>Pt</td>
</tr>
<tr>
<td></td>
<td>33</td>
<td>Self and peer assess the introduction of a persuasive essay</td>
<td>S, P, I</td>
<td>Web</td>
</tr>
<tr>
<td></td>
<td>34</td>
<td>REVISION OF THE PERSUASION introduction</td>
<td>S, I</td>
<td>Pt</td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>Class exercise on assessment of arguments</td>
<td>Group</td>
<td>Pt</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>INTRODUCTION TO RESEARCH PROJECT</td>
<td>S, P, I</td>
<td>Pt</td>
</tr>
<tr>
<td></td>
<td>43</td>
<td>REVISON of Introduction, following peer and instructor feedback</td>
<td>S, I</td>
<td>Pt</td>
</tr>
<tr>
<td>Write clearly reasoned argumentative essays.</td>
<td>6</td>
<td>WRITE ESSAY on if pharmacy students should be allowed to work</td>
<td>S, P, I, A</td>
<td>BB, Mail</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>REVISE essay in light of instructor and Albany student feedback; include a separate list of anticipated arguments of the audience</td>
<td>S, I, P</td>
<td>Pt</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>Peer assess one argumentative essay</td>
<td>I, P</td>
<td>BB, Mail</td>
</tr>
<tr>
<td></td>
<td>39</td>
<td>PROJECT: WRITE ethical implications of herbal product advertising</td>
<td>S, I</td>
<td>Web, P</td>
</tr>
<tr>
<td></td>
<td>43</td>
<td>PROJECT: REVISE ethical implications, following instructor feedback</td>
<td>S, I</td>
<td>Pt</td>
</tr>
<tr>
<td>Conduct library research and present the results using appropriate conventions and format</td>
<td>13</td>
<td>Work collaboratively to find on the Internet answers to questions on herbas</td>
<td>Group</td>
<td>Web, BB</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>Identify print and electronic sources of information and data bases in library</td>
<td>Group</td>
<td>Web, BB</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>Complete natural products library project</td>
<td>I</td>
<td>Web, Mail</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>Review web sites on documenting web sites</td>
<td>Group</td>
<td>Web</td>
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<tr>
<td></td>
<td>28</td>
<td>Review web sites on quoting, summarizing, plagiarizing</td>
<td>Group</td>
<td>Web</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>Complete paraphrasing exercise on web</td>
<td>Group</td>
<td>Web</td>
</tr>
<tr>
<td></td>
<td>29</td>
<td>PROJECT: WRITE background on a specific herbal product; self assess</td>
<td>S, I, P</td>
<td>Pt, Web</td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>PROJECT: WRITE recommendation of a herbal product; self assess</td>
<td>S, I, P</td>
<td>Pt, Webb</td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>PROJECT: WRITE web evaluation; self assess</td>
<td>S, I, P</td>
<td>Pt, Web</td>
</tr>
<tr>
<td></td>
<td>39</td>
<td>PROJECT: WRITE ethical implications of Internet advertising; self address</td>
<td>S, I, P</td>
<td>Pt</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>Collaboratively find answers to questions assigned to each group and post</td>
<td>I</td>
<td>Web, BB, Mail</td>
</tr>
<tr>
<td></td>
<td>42</td>
<td>PROJECT: WRITE introduction using the data generated by the groups</td>
<td>S, I, P</td>
<td>Pt, BB</td>
</tr>
<tr>
<td></td>
<td>43</td>
<td>PROJECT: REVISE the 5 stage, following assessment feedback</td>
<td>S, I</td>
<td>Pt</td>
</tr>
</tbody>
</table>

**Use technology to locate and organize information and to publish findings on the Internet**

| I-43 | Use electronic resources and data bases in research | Group | Web, BB |
| Use search strategies to find and/or consult information on propaganda, rhetoric, argument analysis, ethical theories, herbal products, advertising, Internet usage | Group | Web, BB |

**Key:** P = Peer; I = Instructor; S = Self; Pt = Print; BB = Bulletin Board
projects involving herbal products and the Internet, which were adapted from the research project that had been used in NP the previous year. NP students evaluated the reliability of Internet-derived information regarding the safety and efficacy of their selected herbal products. The first year CTW students had little knowledge of drugs, mechanisms of action, etc., so the focus of their research was to investigate the ethical implications of advertising a specific herbal product on the Internet. The fourth-year NP students, with their broader knowledge of chemistry and pharmacology, became resources to help the first-year students with more technical issues of herbal products. Once again an attempt was made to create a symbiotic relationship in the writing of these inter-related projects. The parts of the project were submitted in stages, and assessment feedback was given concurrently so students could revise.

NP Project

The course ability outcomes were tied to the project as follows:

**Thinking.** Find, comprehend, analyze, and evaluate information relating to a specific herbal product.

**Communicate.** Read with comprehension written text and graphic materials relating to herbal products. Use oral and written communication to educate pharmacists about natural products. Collaborate effectively with fellow pharmacy students.

**Ethics/Values.** Identify, analyze, and evaluate ethical issues related to the advertising, sale and regulation of herbal products.

The project consisted of five components, which were completed in sequence over a four-week time span.

1. **Herbal Monograph:** A 3-5 page synopsis of botanical identity, isolation methods, chemical composition/stability, and scientific evidence for safety/efficacy claims. Students posted their monographs to the bulletin board of the collaboration page so that the CTW students could use the information.

2. **Evaluation of Internet Sites:** Eight Internet sites containing information about the selected herb were identified by the students and evaluated for both credibility and validity.

3. **Critical Evaluation of the Internet:** Data generated in Part 2 were analyzed and used to prepare an essay evaluating the Internet as a source of valid information about the selected herbal product.

4. **Oral Presentation:** Each student presented to the class a short oral summary about her chosen herb including purported use, safety, efficacy, and the results of the Internet evaluation.

5. **Critical Evaluation of the Project and Ramifications:** Working in teams, students analyzed the composite class results from the project. Each team then chose one of the following options: (i) Evaluate the project (methods, validity, applicability), or (ii) Evaluate the ramifications of student findings (effects on public health, regulatory issues, enforcement). Each team submitted an essay addressing its chosen topic.

CTW Project

The CTW project allowed students to practice the following ability outcomes:

**Synthesis of Ideas.** Retrieve information from a variety of sources, comprehend it, evaluate it, and create a new idea or text.

**Communication.** Conduct library research and present the results using appropriate conventions and format. Use computer technology to assist in locating information, organizing information, and publishing findings on the Internet.

**Ethics.** Construct and analyze ethical arguments.

The CTW project was written in six phases:

1. Research and summarize basic information about a specific herbal product using library resources, Internet sources, data bases, and the herbal monographs written by the NP students.

2. Summarize potential problems with unregulated herbal products, and briefly conclude what recommendations a pharmacist should make to a patient regarding the use of this herbal product.

3. Review a minimum of four Internet sites that market the herbal product, in order to evaluate whether the information listed there is accurate, objective (not colored by self interest), authoritative (written by experts, documented, cites trustworthy sources, supported by evidence), current (up-to-date).

4. Given the facts about this herbal product, the problems with unregulated drugs, and the nature of Internet advertising, discuss the ethical implications of advertising herbal products on the Internet.

5. Collaborate in groups of three to identify factual information that can be used in an introduction regarding Internet usage, herbal product usage, and Internet regulation. Post the answers on the electronic bulletin board so that the information would be available to all students.

6. Integrate the four components into a clear and organized research essay with an introduction and thesis. Edit for grammar, style, and audience. Cite and document all sources appropriately, and provide a list of works consulted.

**CRITERIA**

For each major course assignment, specific criteria were provided. The purposes of the criteria were to give the students a clear picture of what constituted good practice of ability outcomes and to be the basis for assessment feedback. For example, for each of the four sections of the CTW project, specific criteria defined successful performance:

**Introduction:** Establishes ethos (trustworthiness) through documented facts regarding the herbal products and the Internet, through use of credible sources, and through a clear statement of the problem and the thesis.

**Background:** Provides sufficient documented scientific facts regarding the herbal product (ingredients, mechanism of action, benefits/side-effects) so as to provide a basis for the assessment of claims made about the product by Internet advertising.

**Web Analysis:** States a convincing conclusion regarding the reliability of Internet advertisi-
mailed to all students. The CTW used the criteria to provide
the monographs, based upon specific criteria that had been e-
the monograph. CTW students were required to assess one of
each NP student posted on the bulletin board a first version of
provide peer feedback regarding clarity and completeness.

Ethical Implications: Reasons from ethical principles to
to come to a clear and convincing conclusion regarding Internet advertising
of herbal products, a conclusion that
takes into consideration the complexity
of the issues and the arguments of the audience.

To ensure students understood the criteria, exercises were
given in which students, independently and in groups, ranked
eamples of good and poor performance of ability outcomes,
and then empirically identified the basis for their rankings(21).

RESULTS

Introduction to Natural Products

Three main instruments were used to assess student learning
in the NP course. Critical Thinking was evaluated using the
California Critical Thinking Skills Test (CCTST). Changes in
student attitudes/opinions and perceived knowledge about ethi-
cal and natural product issues were assessed with a survey
developed specifically for this course. Student performance on
in-class activities (evaluation of case/clinical studies, debate,
oral presentations) and homework assignments (drug mono-
graphs, term project) was used to evaluate development of the
targeted abilities: communication, critical thinking, and ethical
decision making.

The first evaluation tool, the CCTST assesses three com-
ponents of critical thinking: analysis, evaluation, and infer-
ence. Raw and percentile scores are generated for each of these
areas in addition to a composite score. Improvement was
tracked by repeat administration of the exam; it was given in
the first and last weeks of class. The test questions were not
discussed with the students nor did they have access to the
questions at any time other than during administration of the
exam. Students were advised of their pre-test scores early in
the semester but answer sheets were not returned so the integri-
ty of the repeat administration was not compromised. Four of
the five students in the class took both the pre- and posttests.
Their scores were averaged and are displayed graphically (see
Figure 4). Improvement was realized in the categories of analy-
sis and evaluation; inference remained essentially constant.
The class composite average increased from 71 to 84 percent.
Statistical significance of the improvements was not evaluated
due to the small sample size, but the trend does give a strong
indication that critical thinking abilities improved.

The second evaluation tool was a survey developed to
assess knowledge (actual and perceived) and student attitudes
and opinions that would be influenced by such knowledge.
Responses to the thirty-eight questions were based upon a five-
point Likert scale. Topics addressed included issues related to
the composition, safety, and efficacy of natural products, along
with general ethical theory and ethical issues associated with
the regulation and distribution of natural products. Six ques-
tions were included to assess students’ familiarity with elec-
tronic media and their own use of natural products, but these
questions were not used to evaluate learning. The survey was
completed twice by the NP students: once during the first week
of class and once at the end of the semester. Data were collect-
ed from all five students.

The questions from the survey have been categorized into
knowledge-related and attitudinal/opinion questions. Analysis

Fig. 4. CCTST (Critical Thinking) Results.
of the knowledge-related questions in which students had to demonstrate knowledge in their response (e.g., “advertising of herbal products on the Internet is not regulated by the FDA”) is straightforward: for each question the average student response moved in the desired direction (toward the correct answer) in every instance. Other knowledge-related questions required students simply to assess their knowledge but not demonstrate it (e.g., “I can explain at least two of the major ethical theories, such as utilitarianism or deontology”). The changes in these responses indicated that students perceived increased knowledge over the course of the semester in every case.

The attitudinal/opinion questions were designed to provoke thought and analysis regarding herbal products (e.g., “For the most part, advertising about herbal medicines is as reliable as other types of advertising”). Without exception, the student answers indicated a trend toward increased caution regarding use of herbal products—which was consistent with a course goal of cultivating in the students an informed skepticism regarding unsubstantiated claims and a critical eye for supporting data. The third evaluation tool, student performance on in-class exercises and homework assignments, provided the most compelling evidence for development of abilities. Inherent in the ability-based approach is the requirement to provide multiple opportunities for students to practice the targeted abilities. Active learning was used extensively so student improvement could be observed directly. The small class size allowed for easy monitoring of individual growth.

The development of the skills and abilities necessary to complete assigned tasks was slow but readily apparent. The in-class activities carried out early in the semester required low-order thinking skills. Guidance and modeling were vital components in each step, but the quality of the discussion and insight behind the students’ questions increased as the semester progressed, as did their confidence. Near the end of the term, the NP students debated whether Stevioside (a natural sweetener) should be marketed in the US as a food additive. They did an excellent job—not only arguing scientific points dealing with safety and efficacy but also bringing up ethical concerns associated with marketing compounds of questionable safety, providing reasonable sugar substitutes to diabetics, and allowing the economic interests of competing products (such as aspartame) to influence regulatory decisions.

Increased knowledge and improvement in thinking and communication skills were also obvious upon comparison of the first drafts of the students’ initial monographs to the final drafts of their class projects. The final monographs were interesting, informative, and thorough, showing marked improvement in organization, style, and content. The students expressed pride in having their work showcased on the college web page.

Student attitudes about the NP course were assessed by having them complete two anonymous course evaluation forms during the last week of the semester. The standard form administered by the school consists of ten objective questions and three narrative responses. A customized form was prepared by the instructors to assess perceived improvement on course ability outcomes and to gather input from students about strengths and weakness of the NP course.

In terms of student perception of learning and achievement of ability outcomes, the course was a roaring success. Student satisfaction was obvious from the responses—both objective and subjective—on the school survey. Of particular note was that every student agreed strongly with the following statement: “The instructor promoted understanding of the material rather than just memorizing it.” And although students found the workload of the elective to be “heavy,” each of them wrote that they would recommend the course to a friend.

The students were asked specifically how collaboration with the CTW students affected their learning. Two of the students responded that their learning had improved due to the interaction; the other three said that the collaboration had little or no effect—but they did appreciate the value of peer reviews and were benefited greatly by the CTW instructor. Several students mentioned that there weren’t enough interactions to make a significant difference and that the interaction that did exist was too impersonal. This is a known shortcoming of electronic communication and should be actively addressed in future implementations.

Students found the preparation of herbal monographs to be the most helpful class activity, particularly since they were afforded the opportunity to revise based upon feedback. Also mentioned in this regard were the Internet research (though some complained about the amount of work it entailed) and the class debate. When students were asked for suggestions for course improvement, the comment repeated most often was that tests or quizzes should be incorporated to force students to internalize factual information. There were also suggestions to distribute the workload more evenly across the semester; they thought it was too heavy toward the end.

Critical Thinking and Writing

The CTW course was built upon the principle of assessment as learning. Continually throughout the semester students were assessed not merely to provide evidence of learning but to provide a tool for learning. Self learning was one of the course’s four ability outcomes. For instance, students completed the California Critical Thinking and Dispositions Tests in order for them to identify their strengths and their areas in need of development so that they could appropriately plan their learning strategies. Similarly, grammar and punctuation diagnostic tests completed early in the semester guided the work students would do in these areas during the course of the semester.

All written work (homework and in-class work) was maintained in a course portfolio, which was not only a record of student achievement but also a planning tool for improvement in ability outcomes. Periodically the instructor collected and provided feedback to the portfolio work, but more important were the three portfolio assessments performed by the students themselves at a third of the way through the semester, at midterm, and at course completion. Students listed three strengths and three areas needing work, what problems they were having with the class, what they could do to address the problems, what the instructor could do to help them, and how they assessed their progress thus far. After they completed the portfolio self assessments, students met with the instructor to get oral feedback regarding their evaluations. Later, students evaluated themselves on each of the course ability outcomes, as evidenced by their portfolios and created detailed plans for the two areas most in need of improvement.(35) Students then met with the instructor to review and, if necessary, revise the plans.

As first-semester college students, many found such self assessment challenging. There was a tendency to over-rate one’s performance and to be too abstract or general in student-generated plans for ability improvement. This was expected and hence was a primary motivation to include “self learning”
as a course ability outcome in the first place. As the semester progressed, most students came to realistic self assessments and came to understand that improvement is not likely unless one understands what needs to be improved, knows how to improve, and creates a strategy for improvement.

The final course evaluation tool was consistent with ability-based principles: for each of the ability outcomes and their sub-categories, students were asked to evaluate their improvement. Most responses acknowledged improvement in abilities, a few identified areas of much improvement, and a few identified areas in which they stayed the same—assessments that were consistent with the instructor’s own evaluation. To provide a context for the responses, students were also asked to identify their abilities at the beginning of the semester since high initial ability could limit the amount of expected improvement. For instance three students said they were at the beginning of the semester above average in use of computer technology and that at the end of the semester one student said he/she stayed the same in computer abilities.

Generally, anonymous student comments on the course support the effectiveness of the approach in developing the course abilities. Reasons given for skills improvement included the controversial subjects studied, multiple help sessions, and a rigorous instructor. As a first-year general education writing requirement, CTW is a course that not many entering pharmacy students take voluntarily or with great joy. The student comments were thus encouraging.

Not all students excelled in the course. Those interested in ability development tended to profit most from the course. For those who were more interested in a passing grade rather than ability development, the course was much more challenging and their goal was much more difficult to achieve. Student final self assessment of ability development is consistent with the instructor’s assessment, based upon portfolio reviews.

**DISCUSSION**

This joint project was most successful in helping students to develop clearly-defined general ability outcomes within professional content areas. In addition, the collaboration between a required general studies course and a professional elective helped to illustrate the inter-relationships between general ability outcomes and professional practice. These abilities were the basis for course organization, which included multiple practice opportunities that incorporated explicit criteria and a variety of self, peer, and expert assessments. Faculty and students both perceived an improvement in students’ abilities.

The novelty of inter-collegiate collaboration and the allure of technology helped stimulate enthusiasm and motivation in both students and instructors, which allowed the courses to be more challenging. The Internet and other electronic technologies provided rapid and efficient communication and allowed the incorporation of up-to-date scientific information and relevant, authentic material for case studies. The Internet also provided easy access to reference and instructional materials.

Many of the problems with the course can be associated with any first-time offering. The instructors were a little tentative initially, and did not fully exploit the possibilities for inter-collegiate collaboration and mentoring. Also, not enough was done to encourage interpersonal interaction between students at the two schools. A setback to such interaction was the instructors’ failure to provide early, adequate training regarding the purposes and use of peer assessments. Misunderstandings on the part of both the assessor and the students assessed generated some minor friction early in the course. More involve-

ment of the NP instructors in the CTW course also would be desirable.

Technological glitches did occur. At times the Nicenet server was unavailable, apparently due to over-load (a problem that has since been corrected by the procurement of a new server). The NP students could have been provided additional computer training early in the semester, and it would have been helpful for them to have had increased access to the Internet. Greater use and availability of instant messaging could have increased student interaction and productivity. It became clear it would have been better in the CTW course to have begun the research project earlier. Stage five of the project—“Collaborate to identify factual information that can be used in an introduction”—faltered because some students did not post their information.

In an effort to enhance development of abilities in the NP course, practice of ability outcomes was the primary determinant of grades, with a corresponding de-emphasis on grading and testing. A resulting unexpected problem was that because the early practice of abilities was formational, students did not have as clear of a picture of where they stood with grades as they would have liked. Students thus surprised the instructors by asking for quizzes as a means to assess their knowledge of content.

The abilities-based approach and concentration on critical evaluation of natural product information (from scientific and ethical perspectives) took the focus of the NP course away from memorization of specific data and purported uses of common herbs. This is not to say that such information was excluded, but as noted earlier, the volume was reduced from that presented in the original NP course. Communication skills were also enhanced and students were taught to pay particular attention to audience.

It was gratifying to see that four of the five students, at the end of the revised course, indicated on the course evaluation that they felt qualified to counsel patients about herbal products, whereas initially none had felt qualified. Through the research project, students demonstrated the ability to independently evaluate information about products they had not previously studied—a necessary skill in light of the ever-expanding herbal product market. Interestingly, of the five suggestions made by Wetzel, et al for CAM courses in medical schools(17), the two that are applicable to herbal products (“focus on critical thinking and critical reading of the literature” and “teach students to talk to patients about alternative therapies”) have been addressed by the NP course.

The portfolios and student assessments in the CTW course also reflected increasing proficiency in the targeted abilities. It became clear, though, that an ability-based approach promotes but does not guarantee superb student performance. In this required course for first-year college students studying materia outside their fields of interest, a few students remained unconvinced about the need to develop these specific course ability outcomes at the level specified by course criteria, and they performed in accordance with those beliefs. Nonetheless, the approach was effective in establishing rigorous, public criteria and an extensive assessment system that established integrity between performance and success in the course.

Unexpected success was achieved with distance learning. Distance learning usually implies sophisticated technical knowledge and extensive support. These courses were developed by faculty with an average knowledge of technology and with minimal outside support and minimal cost for students who initially needed little more computer skill than word pro-
cessing. This project demonstrated that technological novices can create and/or use course web pages, electronic bulletin boards, and e-mail in order to develop a pedagogy that includes abilities-based outcomes, active learning, critical thinking, distance learning, and collaboration/mentoring across courses, colleges, and college levels. It would seem that such an approach could be applied somewhat painlessly within institutions that have not expended significant resources on distance learning. In a profession that increasingly values collaboration, this strategy can be effectively employed across a number of disciplines and settings.

CONCLUSIONS

The instructors agree that although the collaborative project involved tremendous amount of preparation, the rewards were worth the effort. And of course, much less work would be required in a second iteration. With thirteen students combined in two courses, it was comparatively easy to provide detailed feedback regarding practice of course ability outcomes and to develop rapport with students. It is not known what the results would be if there had been more students involved in both courses. In this project, though, the collaboration of faculty from various disciplines (medicinal chemistry, pharmacology, and English) resulted in a restructuring of traditionally-taught courses. Course activities and assessments were more carefully anchored to ability outcomes so that students had multiple opportunities to practice and receive feedback regarding ability outcomes. Electronic technology broadened student perspectives and enabled them to practice abilities within contemporary, relevant contexts.

It is important to temper our enthusiasm and assessment of these two courses, for, realistically, significant student development is achieved not in courses but in semesters and curricular years. However, if pharmacy faculty designed an ability-based curriculum which integrated professional and general outcomes, constructed course strategies around those abilities, and provided clear, realistic assessment of student performance of the abilities, pharmacy educators could be more confident about establishing the “integrity in the college curriculum” that has been urged over the past decades.

References and Notes


References and Notes


(17) The NP syllabus can be found on the Internet at http://rx.stlcop.edu/~tlzatic/np-cw.html

(18) The CTW syllabus can be found at http://rx.stlcop.edu/~tlzatic/np-cw.html

(19) Nicenet can be found at http://nicenet.org


(21) Sample criteria forms can be found at http://rx.stlcop.edu/~tlzatic/np-cw.html


(23) Samples of assessment forms can be found at http://rx.stlcop.edu/~tlzatic/np-cw.html

(24) The monographs can be found at http://panther.acp.edu/web/herb/monograph.htm

(25) The portfolio self assessment can be found at http://rx.stlcop.edu/~tlzatic/np-cw.html