Implementation of a New Course with a Focus on Active Learning Through Integrated Curricular Approach: Pharmacy Care Laboratory I

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ABSTRACT. This paper examines the implementation of a problem-based, active-learning approach in the pharmacy curriculum at the Northeast Louisiana University School of Pharmacy. Over one semes-

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The authors would like to thank Dean William Bourn and Dr. Philip Medon for their support, direction, and encouragement for the implementation of this course and Dr. Hunter, Dr. Kirschbaum, and Ms. Chandler for their invaluable contribution and facilitation.

ter, five interdisciplinary faculty (Unit Coordinators) each provided two weeks of small-group, problem-based active-learning experiences in their areas of specialization. This one semester-hour course, Pharmacy Care Lab I, employed active learning concepts in laboratory and experiential settings with the objective of correlating basic and clinical knowledge with pharmaceutical care applications. The goal of this course was to provide early professional practice experience and decision-making activities. Students were expected to develop and practice critical thinking and problem-solving skills by integrating and applying knowledge from the basic and applied sciences. Adjusting to this different paradigm of learning was challenging for students as well as faculty. Outcomes included establishing connections between the course work and experiential, problem-based education. The initial experiences with an active learning endeavor were positive and supportive of this educational methodology. They also provided support for the expansion of these learning activities to other courses. *[Article copies available for a fee from The Haworth Document Delivery Service: 1-800-342-9678. E-mail address: getinfo@haworthpressinc.com]*

KEYWORDS. Pharmaceutical care, active learning, problem-based learning, blood pressure monitoring, dietary supplements

INTRODUCTION

As early as 1975, the Millis Study Commission on Pharmacy denoted three intellectual skills essential to the practice of any health-care profession. These skills include: (a) problem identification, (b) problem-solving, and (c) continuing learning (1). In recent years, a mandate to the pharmacy profession from consumers, professional organizations, and health-care providers has evolved to develop and implement pharmaceutical care. The American Association of Colleges of Pharmacy states that pharmaceutical care focuses pharmacists' attitudes, behaviors, commitments, concerns, ethics, functions, and outcomes toward the improvement of a patient's quality of life (2). As pharmaceutical care becomes an essential component of pharmacy practice, pharmacists will be accountable for identifying and solving higher-order clinical problems (2). The implementation of pharmaceutical care will necessitate the use of communication skills, information retrieval, self-directed learning, and critical thinking applied to proactive problem-solving (3,4). This paradigm shift in pharmacy education focuses on actively engaging students in such higher-order thinking

tasks as analysis, synthesis, and evaluation. Numerous inquiries have evaluated teaching the process of problem identification and solution to pharmacy students by active learning (1,3). Strategies promoting active learning may be defined as those instructional activities involving students in doing things and thinking about what they are doing. In active learning the student is responsible for actively acquiring information and skills by identifying knowledge deficiencies. One such active learning strategy is Problem-Based Learning (PBL). PBL is an instructional method in which a situation or problem is used as the framework for learning and usually serves as a stimulus for developing critical thinking and problem-solving skills and acquiring knowledge (5). An essential operative component of the PBL approach is the use of student learning activities which "drive" the learning processes. With these educational methods in mind, the Curriculum Committee at the Northeast Louisiana University School of Pharmacy established a formal problem-based learning course in the first professional year of instruction to define an early framework upon which to build active learning.

This course is required for first-year students, but was also offered as an elective for second-year students. The five disciplines included in this Pharmacy Care Lab I course are identical to traditionally taught classes taken concurrently by first-year students, and include pharmacy administration, pharmaceutics, drug literature evaluation, pharmacology, and biochemistry. For each unit, students participated in a three-hour laboratory session during two consecutive weeks. The faculty member responsible for the corresponding lecture course developed a problem set or practicum which students worked on over the two-week period. The practicums did not necessarily employ all parameters of PBL. In all sections, however, students participated in an active group-learning process which necessitated application of the essential components of the problem-based learning approach. During the initial session, the students working in groups of five or six, reviewed the problem set, identified associated learning issues, selected learning objectives, delineated appropriate resources, and assigned responsibilities within the group. The following week each group synthesized and discussed information and formulated a group consensus on solutions to the problem. During some of the follow-up sessions, each group was also required to do a verbal presentation of its findings to the other groups. An essential component of "pure"

PBL is the use of facilitators to guide and direct the course work. These individuals do not provide the knowledge, but serve to guide the student's active learning (2). Unit instructors and graduate teaching assistants from the School of Pharmacy, along with second-year pharmacy students, served as facilitators for each of the student groups. These individuals shared their experiences with academic and practical problem-solving, information search strategies, and group interaction to guide students toward solution processes. Respective unit instructors assigned a "satisfactory" or "unsatisfactory" grade to each student at the completion of each two-week subject period. Grades were based on individual student performance, participation in group dynamics, solutions to problem sets, and presentation of those solutions. Students were allowed to remove an unsatisfactory grade by completing an extra assignment designated by the instructor. An additional course requirement was for the student to arrange and participate in a three-hour observation period at two different pharmacy practice sites of his or her choice. Students then wrote a paper describing, comparing, and contrasting the practice site experience, and this paper was then submitted to the course coordinator. Finally, each student was required to compile an ongoing course journal to record observations, notable learning experiences, problems, and suggestions derived from the course. A pass or fail grade for each student was determined by the course coordinator based on grades assigned by each instructor, evaluation of the practice site experience and paper, and the student journal. At the end of the course, each student completed a standardized university course evaluation form. The description of each individual course unit follows.

UNIT ONE

Design of Assignment. The objective of this unit was to give students an opportunity to apply principles of management and marketing to the practice of pharmacy. Through an interactive learning approach, the students were asked to design a pharmaceutical care pharmacy. This included choosing a name, selecting a target market, writing a mission statement, listing products and services to include, and designing the layout and merchandising for the pharmacy. Working in teams, the students discussed each of the project elements and planned a pharmacy specific to a target market. By specializing the

practice of pharmaceutical care, the students were focused on the future role of pharmacists in disease-state management. The project was designed in two parts: The first part involved the students understanding the personality differences among individuals and applying this understanding to group dynamics. The second part required the student teams to strategically plan a pharmacy. Before the teams could work together, the course instructor presented a short lecture on Psycho-Geometrics (6). The session involved defining different personality types, considering behavioral traits specific to each type, and appreciating the synergy created when individuals with diverse personalities are brought together as a team.

To illustrate personality types, geometric shapes were used. The ''box'' was described as the data collector, organizer, hard worker, rule maker and follower, and punctual loner. The ''triangle'' was the leader, being opinionated, ambitious, a fast thinker, politically smart, and a strategic planner. The ''circle'' was depicted as the people person, being ''touchy,'' a team player, a good listener, a communicator, a nurturer, and a peace maker. The ''squiggle'' was the high-energy, creative, and idea person that hates routine and closure. Finally, the ''rectangle'' was identified as the person in a transitional or growth phase, such as a student, who can be different shapes as the situation presents itself. In addition to the categorization of students, Psycho-Geometrics can be applied to the different personality traits of patients because of the related impact on patient response to counseling.

After considering the different personality types, the students were divided into groups and were asked to discuss each shape and to identify each team member with a shape. This exercise was designed to get the students acquainted before the teams began their projects. Each group selected a recorder to keep notes and prepare the paper for presentation. This, naturally, was a ''box'' person. Each group also selected a group spokesperson to present the team's work to the rest of the class. A ''triangle'' was recommended for this job. After categorization of personality types, the groups moved on to the second part of the unit.

The second part of the project required the students to develop a pharmacy by choosing a name, selecting a target market, writing a mission statement, and designing the layout and merchandising. While these concepts had been covered in a lecture format course, Pharmacy 350, students were asked to apply this knowledge to a pharmacy

structure. The project also incorporated the philosophy of pharmaceutical care so the pharmacies designed by the students would promote a professionally advanced practice. The second session continued with the same groups and built upon the first session by asking the groups to further develop their pharmacies. The specific assignment was to list the products and services for the pharmacy and to illustrate on a transparency the layout and design of the pharmacy. The students were expected to use their knowledge of visual selling and structure.

Implementation of Assignment. Two classes, each three hours, were held one week apart. During the first week the overall project was discussed, and then the class followed with two hours of group interaction. The students then numbered themselves 1 through 8 repetitively until all persons had a number; then the class was asked to split into groups based on their numbers. This resulted in eight systematically randomized groups of five or six students each.

The project for the first week was to discuss group dynamics using Psycho-Geometrics. After getting to know the team members' personality types, the groups worked on their assignment. During the last thirty minutes of class, each group presented its results to the class. For week one, this included the names of students who were not accustomed to oral presentations. In addition to the group spokespersons, students participated by introducing themselves and saying a few words about their backgrounds.

For week two, the structure was to continue working in the same groups. The assignment was to list products and services for the pharmacy and to design the layout and merchandising of the pharmacy. The students recorded their work on assignment sheets to turn in and drew their pharmacy layouts on transparencies. Each group was asked to present their pharmacy concept beginning with the name, target market, mission statement, products, and services. The presentation was to conclude with the physical layout. Each member of the group was asked to take a different part of the presentation.

Student Outcomes. Each group finished the pharmacy administration section of the course with two written assignments and two oral presentations. The students realized just how hard a unique and captivating name for a pharmacy is to produce. They also had an opportunity to write a mission statement, which is much more challenging than many of the students imagined. Considering their work to be a mini-business plan, the students thought strategically about capturing a

segment of the market. The most popular types of pharmacies developed by the students were pediatric, geriatric, and wellness-focused pharmacies. Several of the student groups included a logo with their names. The groups developed target markets based on their area of specialty and incorporated their concepts into written mission statements, which included the provision of pharmaceutical care. This synthesis was a rewarding experience for students as they put these elements together to form a pharmacy structure.

The second part of the project was the analysis of the pharmacy layout and merchandising. The groups researched products and services to include in their progressive pharmacies. Several of the unique ideas, in addition to general counseling regarding prescription and over-the-counter (OTC) products, included fingerprinting, childhood immunization services, body composition, herbal remedy recommendations, web-site access, hot lines, dietary counseling, wellness libraries, in-home counseling, and home-health assessments.

Evaluations. Students were asked to evaluate this section of the lab using standardized university assessment forms. Also, students were asked to keep daily records of their experiences and feelings about the course.

Conclusion. This unit of pharmaceutical care lab seemed to work quite well overall. Improvements, such as making sure that students had clearly written project assignments, were made on a daily basis. Having the students work in systematically randomized groups was a plus since this eliminated existing cliques. Another recommendation was to have students work within groups during the assigned lab time, with little or no work outside the classroom. This limited the amount of time required of the students and gave instructors and facilitators an opportunity to guide the groups' progress.

UNIT TWO

Design of Assignment. The objective of this unit was to present students with PBL experiences that were designed to provide critical thinking abilities as well as problem-solving skills specific to pharmaceutical calculations, pharmaceutics, and pharmaceutical care. The focus of this unit was on extemporaneous preparation of ophthalmic solutions and solving problems pertinent to ophthalmic products. The assignments were designed to integrate and apply the concepts pre-

sented in the didactic section of the course. The assigned problems contained information on antimicrobial agents, pH, pKa, buffers and buffer capacity, tonicity agents, sodium chloride equivalents, solubility, acid-base theory, and incompatibilities specific to the ophthalmic formulations. The problem sets also covered topics such as medication orders, strengths, and dosing. The students were expected to incorporate and connect the above information in to an understanding of sterility, preservation, isotonicity, buffering, and viscosity related to eye preparations.

Presentation to Students. In the first meeting, the course instructor provided an overview of active learning, emphasizing the importance of critical thinking in problem-solving and in providing pharmaceutical care. The unit instructor then presented the concept of the PBL approach (7,8), clearly identifying the three stages which include: (a) identifying the learning issues for a given problem, (b) independent learning of the selected learning issues, and (c) problem-solving within a group. Subsequently, the assignment was presented to each group following a brief introduction to the PBL process/framework.

Implementation. The class was divided into small working groups of students. Each group spent approximately two three-hour sessions in this unit. At the beginning of the first session, each group was presented with a case study. The students in each group were asked to participate in a discussion to define the problem and identify the learning issues pertinent to the given assignment. The unit coordinator and student facilitators worked together with the students as a resource to facilitate the discussion on the assignment. The responsibility of the coordinator/facilitators included: (a) stimulating the need to know, (b) letting students make connections between facts (data) and hypotheses, (c) moving the problem along, (d) making a judgment call when necessary, (e) keeping reference material handy, (f) presenting questions which makes the students think, (g) asking students to synthesize, and (h) making students ask questions or seek information from fellow students. After the completion of discussion, each group was asked to develop at least ten learning issues and divide the issues among the members of the group for independent learning. After this step, each student learned independently and collected the pertinent information related to the problem. In the follow-up session, students returned to their group and shared the independently acquired information. Students at this stage began the analysis phase, where the

information collected was compared to their knowledge base through an interactive dialogue. Each group proposed a solution and then evaluated its solution to determine if it was a reasonable solution to the problem assigned. Finally, each group gave a five-minute presentation of its solution to the rest of the groups. The coordinator/facilitator concluded the session by providing the feedback on the group presentations and some alternative approaches to solve the given problem. The implementation of this unit is shown in Scheme I.

Student Outcomes and Evaluations. Adjusting to the PBL learning paradigm was challenging to students. Following initial frustration and confusion, students gradually accepted the process and understood the benefits of PBL. The 169 students enrolled in this course were asked to complete the evaluation form by answering a questionnaire designed to evaluate the unit. The student responses to questions related to PBL model and the teamwork on a project are summarized in Table 1.

When asked to list the things they liked the most about the unit and the PBL process, the students frequently cited: (a) interactive learning, (b) experience of seeking out information, (c) self-paced learning, (d) active participation rather than sitting in lectures and making notes passively. When asked to list the things that they liked the least, most frequently submitted responses were: (a) lack of direction, (b) starting from "zero," (c) relating information to their group, (d) time consumption, and (e) poorly structured problems.

Conclusion. The definition of the problem, identification of learning goals, analysis, solution, and evaluation are considered as essential elements of critical thinking and problem-based learning. The essence of this active-learning process is that the problems drive the learning, whereby students set learning goals and take complete responsibility

SCHEME I. Implementation of Pharmaceutics Unit Through PBL

Identify learning issues
Identify the informational resources
Independent learning/self-directed study
Collection of the pertinent information
Sharing of information
Problem-solving
Evaluation
Presentation
Coordinator/facilitator feedback

TABLE 1. Student Evaluation of Unit One.

1. I found the Problem-Based Learning Module:[a]	
Challenging	38%
Frustrating	25%
Interesting	15%
Worthwhile	15%
Of little value to me	7%
2. I found the requirement for TEAMS to work on a project:[b]	
Worthwhile	53%
Interesting	31%
Challenging	9%
Frustrating	5%
Of little value to me	2%

a = 164 responses; b = 158 responses.

for their own learning by working actively and cooperatively. Many students suggested that certain topics would be better understood if presented through active-learning methods.

UNIT THREE

Design of Assignment. This unit was designed with two primary objectives: (a) to teach pharmacy students how to utilize the School of Pharmacy's computerized drug information resources, and (b) to educate them on how to use Internet resources to research drug information questions. During the first week of this two-week unit, students were introduced to the in-house computerized drug information resources and given an assignment to be completed before the next class meeting. To accomplish the second objective, students were shown how to use Internet "browsers" and search tools to obtain information over the Internet. They were then given a drug information assignment to complete during the next week, which required them to use Internet browsers and search tools to obtain information from the Internet. They were then given a drug information assignment to complete during the next week.

Students worked in pairs due to the limited number of computer terminals available in the School of Pharmacy. This arrangement also helped to foster group discussion and learning. Groups larger than two students have not proven practical or effective in past experiences with

computer-resource training. To allow the approximately 60 pairs of students adequate access to the 14 computer workstations set up for student use, the students were to be allowed to complete the assignments during the week when the computers were available. Teaching assistants were available for three hours each afternoon to assist the students in the computer labs.

Presentation to Students. It is impractical to train a large number of students on how to use computers to perform information retrieval without the use of some type of large group demonstration and discussion. However, once the basics have been demonstrated, students learn better from hands-on experience. Therefore, a computer system was brought into the classroom and connected to the School's internal data network. This computer system was equipped with a LCD projection system so that the approximately 30 students in each section could easily see the computer monitor projected onto a wall screen.

During the first week of this unit, students attended a 90-minute training session designed to introduce them to the basic concepts of drug information and how to utilize the School of Pharmacy's computerized drug information literature sources to answer questions. They were then given an assignment to complete before the next scheduled meeting one week later. During the second week, another 90-minute recitation session was used to introduce students to the Internet. A brief history and technical discussion of the Internet was followed by a demonstration on how to use browser software to obtain drug information. The students were then given an assignment to complete during the next week, which required them to use Internet resources.

Implementation. To accomplish the objectives for this unit, a two-part assignment was designed which required the students to utilize in-house computerized resources and Internet resources. For the first part of the assignment, students were given a scenario in which they were asked to identify an unknown tablet (or capsule) based on its imprint. They were told that by a strange coincidence, the only numbers that could be read were the same as the last two digits of their social security number. This was done to avoid all groups "sharing" the same information among themselves, without having to assign different numbers to each group. In addition to identifying the dosage form, they were instructed to obtain all the information they needed to counsel the patient on proper use of the drug including any potential drug interactions. To answer these questions, students were instructed

to use the School of Pharmacy's in-house computerized drug-information resources. Each pair then wrote a report containing the required information. The second assignment required students to use in-house resources to find generic providers of the drug they identified previously. They were then instructed to use Internet sources to evaluate these generic providers and determine which provider they felt most comfortable recommending for use in their pharmacy. Each pair was asked to prepare a report of its findings and recommendations, and to list the Internet Uniform Resource Locators used to obtain the information.

Outcomes. Computer equipment problems arose which caused many of the student computer systems to be unavailable during this unit. To make up for this, students were given until the end of the semester to complete the assignments. Student comments to faculty both during and after completion of this experience were overwhelmingly positive. Reports turned in by each group were used to assess mastery of the skills required by each assignment.

Conclusion. Training students to use computers to answer drug information requests lends itself well to problem-based learning. Indeed, it would be difficult to imagine any other way to train students to utilize these resources to obtain information. Using computers to do anything requires direct interaction, and students do not learn to use them properly without hands-on experience. Providing a specific problem to the students forces them to learn to use the computer systems. It also gives them the confidence they need to use the systems to obtain information for other courses and later in their career.

UNIT FOUR

Design of Assignment. The objective of this two-week unit was to provide the students a basic training opportunity in the sphygmomanometric measurement of blood pressure. Students also were given a variety of assignments to demonstrate how varying conditions and circumstances might alter blood pressure measurements. The objectives in the first week of this section were: (a) to introduce students to blood pressure measurement, (b) to provide students with the opportunity to measure each other's blood pressure, and (c) to gain an awareness of problems inherent in obtaining accurate measures of blood pressure using this method. The objectives of the second week were to

allow the students additional practice in taking blood pressures and to demonstrate to the students how individual blood pressures differ under varying conditions of exercise or stress.

Implementation. During the first session the students were shown the section on measuring blood pressure on an interactive physiology CD-ROM program on cardiovascular physiology (9). A projection monitor and a large screen were used to provide visible access to all the students in the room. This computer program is an efficient and effective method of demonstrating the origins and meaning of systolic, diastolic, mean arterial, and pulse pressures. The program simultaneously provides visible images of arterial pulse flow, graphical displayed blood pressure changes, and sphygmomanometric readings, along with concordant auditory demonstrations of Korotkoff sounds.

After viewing the demonstration, the students separated into groups of four or five for the purpose of practicing blood pressure measurements. The students were instructed in the appropriate methods of using a stethoscope and sphygmomanometer. Following the instruction, the students were asked to take two measures of the blood pressure and pulse rates of two other individuals in their group. It was done in such a manner that each member of the group would have his or her blood pressure taken at least twice by two other group members. At the end of the practice period, the students' findings were discussed in terms of variation in measurements between individuals and within individuals, as well as possible sources of variation and error relative to these measurements.

The second week the students reassembled and were instructed to divide into small groups to identify an individual within their group who could reliably measure the blood pressure of any other member. Then, they were told to elect a representative from their group who would participate in an activity designed to mildly or moderately affect blood pressure. The blood pressure of the representative was recorded at that time. The students were then asked to generate a list of occurrences and behaviors that might alter the blood pressure of a normal individual. They then called these out to the instructor who in turn wrote them on the blackboard. Interestingly, in all sections of the lab the first item mentioned was stress. Other items invariably included exercise, drugs, sleep, and sexual activity. This list was ostensibly used as a basis for the blood pressure-altering activities.

Four group representatives were assigned to exercise: two exercised

small muscle groups (such as arm-curling loaded book bags to the point of fatigue) and two exercised large muscle groups (by climbing up and down several flights of stairs). A fifth group representative was assigned to go into an adjacent room, assume a recumbent position on a table, and relax as much as possible for 15 minutes. A sixth representative was assigned to perform the Valsalva maneuver (10) in a moderate fashion that could be sustained while his or her blood pressure was being measured. Representatives of the seventh and eighth groups were told that they would be required to sing a popular song in a solo performance before their pressures were recorded and before the assignments were made. Finally, all were recorded again immediately following the completion of their respective activities. The singers also had their blood pressures measured just prior to their singing performances (for most individuals this "prior performance" blood pressure reading showed a distinct departure from normal, providing evidence of anticipatory stress). Following the completion of all the activities, the "before and after" blood-pressure readings were listed on the blackboard and details were discussed in terms of magnitude of effect and individual variation, as well as the effects of previous conditioning, experience, and age.

Outcomes. The outcomes of the this unit were consistent with the objects in that the students were exposed to and obtained some practical experience in the measurement of blood pressure by traditional methods. The students noted variations in the range of blood pressures within the members of their class as well as variations within the same individual depending on who measured the blood pressure and under what type of conditions measurements were made. While no formal steps were taken to evaluate either the student's performance or their perceptions of the lab, there was the general sense that the exercise was beneficial to the students and was well received by them.

UNIT FIVE

Design of Assignment. This unit had two primary objectives. The first objective was to provide students with experience in interpreting printed label information provided on labels of OTC dietary supplements. The second objective was to develop the skills necessary to provide meaningful information to customers regarding the use of OTC products. As a means of attaining these objectives, commercially

available weight-loss products were utilized. These products are particularly useful in that they contain a wide variety of substances, some easily recognizable, some more obscure. Information on package labeling was found to be unreliable, and there was considerable variance in product information from different sources. Consequently, students were required to evaluate the rational behind the conclusions expressed about the products in different information sources. This is particularly true in weight-loss products, which often claim a mechanism in the absence of significant scientific support. Students evaluated the effectiveness of their product in terms of their knowledge of physiology, pharmacology, and biochemistry. The products were chosen randomly from the wide selection available at a local pharmacy. Most products contained at least three ingredients. Some contained as many as 62 different compounds. While some products listed a primary active ingredient, the majority did not. The most common ingredients in these products included chromium picolinate, hydroxy citric acid, pyruvate, carnitine, inositol, and choline. In addition to the ingredient list, most products also included a diet plan and the manufacturers' rationale as to the mechanism of action for each major ingredient.

Presentation to Students. On the first of two class sessions reserved for this problem, students were given a syllabus supplement to the Pharmacy Care Lab which contained the objectives of the exercise (as stated above), the problem, and the format which would be followed for each session. The problem was started as follows:

> A 120 lb., 5′4″ woman with a two-year old child approaches you at the local drug store where you have been working for the last six months. The customer hands you a weight-control product and says, "Excuse me, I was wondering if you know if this product really works? There are so many different weight-loss products on the shelf that I just can't decide which one I should use."

Students were asked to consider the customer to be an informed consumer who had some training in biological science and thus would require a well-reasoned answer. Students were instructed that their response should include: (a) the potential effectiveness of the product, (b) identification of the main active ingredient and its mechanism of action, (c) evaluation of the validity of the manufacturer's claims, (d) evaluation of the appropriateness of the product for this customer, and (e) evaluation of any safety issues involved in the use by this customer.

Implementation. Students had already been introduced to the method of PBL described previously. Each section of 40 students was divided into two rooms for each day of the two-day exercise. The 20 students in each classroom were then subdivided into four groups of five students each. Each room contained an instructor and two facilitators. Facilitators were asked to refrain from making judgments about the product and to encourage students to reach their own conclusions based on the available evidence.

In the first class session, students were asked to identify the learning issues and resources available to solve the problem. Individual students were then given the task of utilizing the available resources to solve their particular portion of the problem. Different groups divided the tasks in different ways. Some groups assigned each group member a different ingredient or group of ingredients to investigate, while others subdivided the different components of the answer they would give the patient. The remainder of the first session (two hours) was devoted to collecting information. Some groups completed tasks within the time allotted and then returned to discuss their findings. Other groups required more time and met outside of class time to complete this portion of the exercise.

The second three-hour session was utilized as a group discussion period followed by a presentation of each of the products. Groups were allowed one and one-half hours to complete their discussions and integrate the information gathered by the individual group members. Following this, groups presented their findings to the class as a whole. Two presentation formats were utilized:

Format I: Two sections were asked to provide a group presentation to the remainder of the class. These presentations involved the students in each group standing in front of the class and orally presenting their findings. Each group was given 10 minutes to present its response to the patient, followed by a five-minute question/answer period. This format proved difficult to manage. Each student tended to present only his or her portion of the answer, with little integration of information from the whole group. In addition, while the question period was intended to stimulate whole class participation, the result was often the instructor asking the questions while a particular student attempted to answer. Whole class participation was rare.

Format II: The second presentation format was an attempt to make the presentation stage of the exercise more stimulating and encourage

more discussion of the products. To this end, a role-playing exercise was developed. Students were asked to exchange their product with that of another group. Each group was then asked to write down five questions, which they would ask about this product if they were the customer described in the problem. Two groups of ten were brought together with one group acting as customer and the other as pharmacist. The customer group asked questions and requested follow-up information from the pharmacist group. Facilitators acted as mediators of the discussion. Customer groups were encouraged to ask for enough information to make a decision and to require a rational answer from the pharmacist for every question. The customer groups were told to remain firm in their desire to lose weight and not be easily persuaded to give up on the product. If the pharmacist group determined that a product was ineffective, the customer group was encouraged to ask for alternatives to this product. This approach stimulated significant discussion both within each group and between the pharmacist and customer groups and required much less involvement of the facilitators than did the first format.

Student Outcomes and Evaluations. Students evaluated their experiences based on an agreement or disagreement with the questionnaire developed by the unit instructor. The responses were tabulated (Table 2) based on the presentation format used. Eighty students used Format I and 89 used Format II.

Conclusion. The students generally agreed that the problem was realistic and useful to them. They also generally agreed that the experience was positive, facilitators were helpful, and group members participated equally in the exercise. There was a distinct difference between the responses of groups who presented orally and those who presented their findings in a role-play situation. This was particularly evident in questions which refer to the experiential aspects of this exercise (such as realism and development of meaningful skills); however, it is also reflected in the perception of resource availability and helpfulness of the facilitators. The students who participated in the role playing activity appeared to have a better overall impression of the exercise than those with oral presentations. In fact, those students participating in the role-playing expressed more interest in repeating the exercise than those who presented orally. Regardless of the presentation format used, however, the majority of students agreed that presenting the findings was a positive experience.

TABLE 2. Student Evaluation of Unit Five.

	Sections 1 and 2 Oral Presentation			Sections 3 and 4 Customer/Pharmacist Role-Play		
Question	**Agree**	**Disagree**	**Agree/ Disagree**	**Agree**	**Disagree**	**Agree/ Disagree**
1. The problem was presented clearly.	45	55	0.8	61	39	1.6
2. The problem was realistic.	68	32	2.1	83	17	4.9
3. Group members participated equally.	76	24	3.2	70	30	2.3
4. Sufficient resources were available	43	57	0.75	70	31	2.3
5. Facilitators were helpful.	44	56	0.79	75	25	3.0
6. The exercise helped develop meaningful skills.	43	57	0.75	64	36	1.8
7. Reporting of results was a positive learning experience.	59	41	1.4	63	37	1.7
8. I would enjoy doing a similar activity in the future.	32	68	0.47	50	50	1.0

The objectives of this exercise were to provide experience in evaluating OTC products and in presenting meaningful information to customers. In the judgment of the facilitators, both objectives were reached for all four sections. The role-play presentation format offered the added advantage of more realistic customer contact. Facilitators expressed a greater conviction that the role-playing groups experienced an enhanced satisfaction with the experience, an opinion supported by the student evaluation data.

SUMMATIVE CONCLUSIONS

Pharmacy Care Lab I provided an opportunity for students and faculty at the Northeast Louisiana University School of Pharmacy to explore active, multidisciplinary, problem-based learning. This course

had no formal precedent at the School of Pharmacy, so its design and implementation presented a challenge along with some educational rethinking among faculty. For students, the course charted essentially new learning territory with which there was some initial trepidation. Actual experience with Pharmacy Care Lab I proved to be generally positive for both students and faculty and supported both the rationale for and need to continue the course in subsequent semesters.

Dynamic planning and monitoring activities were found to be essential; to that end, a weekly meeting was scheduled for faculty and facilitators of the course. This forum also allowed for an essential interdisciplinary liaison among faculty members who had limited previous interactive teaching responsibilities. An essential planning component was the early determination of the need for and sources of materials and resources which might not normally be required in traditional lecture courses. Course strengths as expressed both by faculty and students included its challenging and interesting applications to actual contemporary pharmacy practice. Hands-on, role-playing activities that expanded personal awareness and enhanced professional capability were deemed positive by both faculty and students. The pharmacy practice site visit experience was considered almost universally to be enlightening and of significant career value to the students. The most problematic aspect of the course, as expressed by students, was the ''out-of-class time'' required for completion of some course work. The implementation of Pharmacy Care Lab I established the value and feasibility of and active, problem-based, student-centered course to explore the implications of pharmaceutical care in pharmacy education and practice.

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