Pharmacy Student Participation in Rural Interdisciplinary Education Using Problem Based Learning (PBL) Case Tutorials

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The purpose of this paper is to describe pharmacy student participation in a rural interdisciplinary health care training program that utilizes a small group, problem based learning (PBL) curriculum. Disciplines represented in the interdisciplin ary program included pharmacy, medicine, nursing, dental hygiene, medical laboratory science, speech and language pathology, public health, social work and physical, respiratory and occupational therapy. Students participated in on-campus and rural community experiences. Both experiences made extensive use of the PBL case tutorial learning method. The rural experience consisted of weekly case tutorials and discipline specific clinical clerkships while living in a rural community for two months. Program evaluation indicates positive changes in student confidence and attitudes related to interdisciplinary concepts. The Program has demonstrated success in the placement of Program participants in rural or underserved areas upon graduation. Interdisciplinary training may result in many benefits; the impact the Program has had on students, faculty and participating rural communities is discussed.

INTRODUCTION

The training of pharmacy students occurs, in many instances, in isolation from other health professions students. However, as pharmacy students complete their discipline specific curriculum and find employment, they are expected to understand, cooperate and work with other health care professionals in providing professional care. Interdisciplinary health professional education is a method that may be used to foster understanding, cooperation, and an appreciation for the expertise each health discipline brings to solving patient problems. Interdisciplinary training for health professions students can involve simultaneous didactic and experiential training experiences.

The Third Report of the Pew Health Professions Commission, Critical Challenges: Revitalizing the Health Professions for the Twenty-First Century, proposes a challenge and recommendation for all health professionals to incorporate team training and cross-professional education\textsuperscript{1}. The Report specifically states, “There is no justification for the artificial separation of professionals in training. While legitimate areas of specialized study should remain the domain of individual professional training programs, key areas of pre-clinical and clinical training must be put together as a whole, across professional communities. This means more sharing of clinical training resources, more cross-teaching by professional faculties, more exploration of the various roles played by professionals and the active modeling of effective team integration in the delivery of efficient, high quality care.”

Baldwin defines interdisciplinary education as “a situation encompassing the mingling of several disciplines traditionally distinct in such a way as to create a unified product: a course, a paper, or even a curriculum.”\textsuperscript{2} “Interdisciplinary” implies cooperation to the point of true collaboration. Interdisciplinary teams pool their knowledge and skills to solve complex patient health problems and work in a more fluid, flexible and egalitarian manner, often with shifting leadership\textsuperscript{2,3}.

A recent review article provides an historical perspective of interdisciplinary health professional education and primary health care team training over a fifty-year period from its inception in the late 1940s to the present\textsuperscript{4}. An initiative authorized and funded by the Bureau of Health Professions Division of the Health Resources and Services Administration (HRSA) in 1988 continues to be one of the most significant initiatives in training health professions students in interdisciplinary health care teams in rural settings. As of fall 1999, programs supported by the HRSA initiative had trained 7,329 students, 4,700 preceptors, and 866 faculty members in interdisciplinary settings\textsuperscript{3}.

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\textsuperscript{3} Personal communication. Judith Arndt. DHHS/HRSA/BHPR/, Room 8A-54, Rockville MD 20857. (October 5, 1999).

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Today, the emphasis of interdisciplinary health professional education is on: (i) the need for interdisciplinary and interprofessional education and practice among health professions students; (ii) greater community input and involvement in designing programs; and (iii) increased interest in continued quality improvement of interdisciplinary teams in education and practice(2). Organizations such as the Kellogg Foundation, the Robert Wood Johnson Foundation and the Pew Commission, in addition to the HRSA efforts, are helping to fund current interdisciplinary health professional training efforts.

The educational methods most often employed in creating interdisciplinary learning opportunities include the problem-based learning (PBL) method and the use of small groups(2,5). Barrows has identified three primary objectives of problem-based learning: the acquisition of a retrievable and useable knowledge base, self-directed learning skills, and clinical reasoning skills(6). The PBL method usually involves the use of real or simulated problems as the initial stimulus to learning(7-9). Learning in the PBL method results from the process of working towards the understanding and solution of a problem. PBL enables students to become actively involved in their own learning since they choose what they will learn after exhausting their collective knowledge base in addressing the problem. Small group processes are useful in fostering interaction, encouraging discipline role perspectives, dispelling stereotypes between disciplines and promoting solutions to the problem at hand.

Interdisciplinary education in the training of pharmacy students is not a new phenomenon. Pharmacy student training in interdisciplinary teams or settings has periodically been reported in the pharmacy literature. Interdisciplinary training settings for pharmacy students have been reported in the following areas: terminal care(10), a family/primary care setting(11), rural, community-based, case-management training(12,13), a geriatric pharmacy clerkship in long-term, acute and ambulatory care setting(14), a joint nursing/pharmacy clinical clerkship (15), a rural health care immersion program(16) and most recently, a rural learning experience for health professions students providing health information and screening services to a geriatric population(17).

One of the primary goals of interdisciplinary training of pharmacy and other health professions students is to produce health care providers capable of effective participation in interdisciplinary patient care. This paper describes our experience in training future pharmacists and other future health care providers to provide interdisciplinary care. The purpose of this paper is to describe pharmacy student participation in an interdisciplinary health care training program that utilizes a small group, problem-based learning (PBL) curriculum in five rural communities throughout the state of New Mexico.

**THE INTERDISCIPLINARY HEALTH CARE FOR RURAL AREAS TRAINING PROGRAM**

The New Mexico Interdisciplinary Health Care for Rural Areas Training Program (“the Program”) at The University of New Mexico Health Sciences Center (UNMHSC) is founded on the conviction that the health of the public, primary care development, public collaboratives and university-community partnerships would be better served by training students in interdisciplinary settings. The premise is that the recruitment and retention of providers can be improved if experiences in rural communities demonstrate and nurture professional interdisciplinary relationships in rural practice. In 1990, a grant from the Health Resources and Service Administration (HRSA) helped initiate the Program which continues to provide pharmacy and other health professions students at the UNMHSC, as well as other interested students from various universities and community colleges throughout the state, an opportunity for interdisciplinary training and rural practice experiences.

**Description of the Program**

The Program involves a seven-month time commitment by students (Table I). The interdisciplinary training program consists of two phases, the on-campus phase (spring semester) and rural community phase (summer). Students are recruited by their respective faculty and assigned to one of five rural community groups. An effort is made to assign students to a rural community group of their choice. Often, students are able to participate in their hometown rural community. The community tutorial groups typically consist of no more than ten students per group and represent at least five different health profession disciplines. If many students are interested in a particular rural community, two teams for that rural community site are formed. Students remain in their respective rural community group for both the on-campus and rural community phases of the training program.

### Table I. Timeline and outline of student and faculty activities related to the Interdisciplinary Health Care for Rural Areas Training Program

<table>
<thead>
<tr>
<th>Time period</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>January-December</td>
<td>Interdisciplinary faculty meetings (1 hour per week).</td>
</tr>
<tr>
<td>August-October</td>
<td>Recruitment and identification of potential students by interdisciplinary faculty members.</td>
</tr>
<tr>
<td>September</td>
<td>UNMHSC* campus-wide Interdisciplinary Day/Open House.</td>
</tr>
<tr>
<td><strong>On-Campus Phase</strong></td>
<td></td>
</tr>
<tr>
<td>November</td>
<td>Program orientation.</td>
</tr>
<tr>
<td></td>
<td>Computer training for students (if needed).</td>
</tr>
<tr>
<td>January-April</td>
<td>Weekly PBL* case tutorial session on UNMHSC campus (3 hours/week).</td>
</tr>
<tr>
<td><strong>Rural Community Phase</strong></td>
<td></td>
</tr>
<tr>
<td>April</td>
<td>Orientation in rural community for Interdisciplinary Program students, faculty and community preceptors.</td>
</tr>
<tr>
<td>June-July</td>
<td>Weekly PBL case tutorial session in one of five rural communities for Interdisciplinary Program students and faculty; community preceptors invited (4 hours/week).</td>
</tr>
<tr>
<td>June-July</td>
<td>Interdisciplinary Program students complete discipline specific clerkships/rotations within rural community.</td>
</tr>
</tbody>
</table>

*a UNMHSC = The University of New Mexico Health Sciences Center.

*b PBL = Problem Based Learning.
On-Campus Phase. A November orientation brings students together as a group for the first time (Table I). Students are given time to introduce themselves and discuss their interest in and expectations of the Program. The orientation introduces the students to interdisciplinary concepts and emphasizes the value of interdisciplinary training to their careers and patient care. They are oriented to the PBL case tutorial method as a means to acquire interdisciplinary decision making skills. The Program timetable, schedule, and faculty are introduced during this orientation. Stipends, housing, transportation and other details related to the rural community phase of the program are also discussed.

From January to April (spring semester) the interdisciplinary students and faculty participate in the interdisciplinary PBL case tutorials every Friday afternoon for three hours on the UNMHSC campus. The Program makes extensive use of the problem-based learning (PBL) case tutorial method which helps students become acquainted with each other’s disciplines, necessitates the development of skills necessary for team function and interdisciplinary problem solving, and fosters respect for the contribution of other health care professionals. Most of the students already have some PBL experience within their own discipline; however, the interdisciplinary nature of these PBL case tutorial sessions is new to the participants.

A typical PBL case tutorial session includes eight to ten students from at least five different disciplines and at least two faculty members from two different disciplines who serve as facilitators. PBL case tutorials are conducted over two tutorial sessions, each three to four hours in length. The first tutorial session is devoted to introducing a new case designed to facilitate new learning in the form of specific content-oriented learning issues. In the first case tutorial, students learn how to generate a problem list, write explanatory hypotheses for the problems listed, and identify learning issues that will be covered by the students during the second tutorial. Exploration of discipline specific roles and knowledge base is emphasized. At the second case tutorial session, students teach the rest of the group the assigned learning issues generated in the previous week’s discussion. Learning issue content is explored through mini-lectures associated with discussion and demonstrations, patient and provider interviews, and visits to community resources.

The first PBL case is typically generated by the faculty and serves as an introduction to the interdisciplinary PBL case tutorial process. Group process skills are also addressed as ground rules for group functioning are generated and students begin to learn the facilitator role. Following completion of the first PBL case tutorial, the interdisciplinary student groups become responsible for two tasks: (i) the responsibility of writing of their own PBL cases; and (ii) facilitation, discussion and completion of the PBL case tutorials.

The PBL case writing task is learned by interdisciplinary student groups who receive case development instructions including discussions about their experiences in completing the first (faculty generated) case, the guidelines for appropriate case development (Appendix A) and the case presentation format (Appendix B). The interdisciplinary student groups usually divide themselves into case generating teams of two to three students from two or more different disciplines.

The students generate PBL cases from their previous personal, educational, or clinical experiences but are required to include additional problems representative of all disciplines. Most often, cases are based on patients the students have seen. The requirement that students incorporate problems representative of all disciplines as they construct cases is a particularly worthwhile task because it forces students to explore and consider other discipline perspectives. This is accomplished either through discussions with their case generating team members from other disciplines or by seeking out practicing health care professionals’ perspectives while constructing cases. The personal, educational, or clinical experiences that students bring to the case writing process are somewhat variable and dependent on the stage of progression within their respective program.

For example, the pharmacy students bring educational and clinical experiences encountered during the didactic and early experiential portion of their formal curriculum. Additionally, pharmacy students also bring previous experiences encountered as an intern working in a pharmacy to the case writing process. The goal in the writing of cases is to facilitate as much interdisciplinary discussion as possible. Appendix A “Guidelines for Developing Interdisciplinary Cases” was developed by an Interdisciplinary Program faculty member as an aid to students in writing their own cases. Appendix B is the outline of a case developed by a group of students in the Program.

For the next three months the interdisciplinary student groups develop cases and facilitate, discuss, and complete PBL case tutorial sessions. The facilitation, discussion, and completion of a PBL case are tasks that require students to work together as an interdisciplinary team in solving the patient’s problems. These tasks allow students to develop self-directed learning skills, problem solve as a group, and identify unclear gaps in their collective knowledge thorough the development and discussion of learning issues. The case discussions also provide an opportunity to teach others their own discipline’s perspective in solving the patient’s problem to other members of the group.

Case facilitation is an additional worthwhile task since it provides students an opportunity to practice communication skills with other members of the healthcare team and provides students with a sense of ownership over the learning process. As the semester progresses, students increasingly assume the responsibility for facilitating their own case tutorials. Faculty facilitators take more of a “backseat” role as the students become more comfortable with the group process and their role as facilitators.

Rural Community Phase. In April, the interdisciplinary students and faculty visit their respective rural communities for a community orientation to the Program. The visits, usually one or one and one-half days in length, are organized to introduce the students to their rural community and to their rural preceptors, and to begin the arrangements for housing accommodations. During the visit, community participants are also oriented, or reoriented, to the Program. The community organizes tours, provides informational material on the community, and arranges a lunch or dinner to which community leaders and preceptors are invited. The students and faculty sometimes lead the community members through a brief demonstration of a PBL case tutorial session.

In late May, the interdisciplinary students travel to their respective rural communities to begin their discipline specific clinical clerkship or internship. Students participating in the Program may or may not be assigned to the same practice location within their rural community. The ideal interdisciplinary team-training model would include the placement of the interdisciplinary student team at the same location, supervised by a
team of health care professionals who are working with the same patients. However, this ideal training model has proven difficult to orchestrate because of the lack of availability of preceptors in many of the rural areas and the small size and staffing realities of many of the rural hospitals which could potentially be used to implement this ideal model.

For example, this ideal training model could be accomplished with “traditional” disciplines represented in a hospital setting such as medicine, nursing, and pharmacy. However, placing a dental hygiene or public health student within a hospital setting may prove more difficult. Additionally, other disciplines such as physical or occupational therapy may provide services for hospitalized patients only one or two days per week. Student placement in these situations also proves difficult given the assumption that most students are required to complete 40-hour per week rotations. Our experience has been that students placed at different clinical sites bring a broader perspective and more clinical variability to their groups’ experience based on the wide spectrum of patients seen. However, students are encouraged to, and often do, identify common patients, community problems, and resources upon which they will depend for their interdisciplinary and rural training experiences. Students are also encouraged to socialize together and meet informally at regular intervals to discuss their interdisciplinary experience and formulate their cases for tutorial.

During the months of June and July, the interdisciplinary student groups meet in their tutorial groups once a week for four hours at a location in the rural community. The rural tutorials are organized in the same manner as the on-campus case tutorials. However, the rural community case tutorials are quite different than the on-campus case tutorials. The PBL cases typically reflect real patients that the students provide care for as they complete their clinical clerkships in the rural areas. Students often compete over the development of cases because of their desire and enthusiasm to develop a case based on a patient or experience they have encountered.

The PBL cases developed during the rural community phase are very relevant to the students as evidenced by the detail and thoroughness of the cases. Many patient specific parameters (such as actual x-rays, lab values, etc.) are included as exhibits in the cases. Some student groups have actually invited the patient to the case tutorial session to provide a true patient perspective. Many groups also organize field trips to various health care settings in the rural communities or have invited speakers to present on community health topics during the PBL case tutorial sessions. The rural community PBL cases reflect the reality of the rural community’s patients, problems, and resources.

During the rural community phase, interdisciplinary case development, team practice and problem solving processes often function smoothly. With practice, students become very efficient at developing, facilitating and solving the interdisciplinary PBL cases. This is not to say that student groups do not argue, challenge or compete with each other during the PBL case tutorial sessions. Constructive group conflict is an expected and important component of the small group and interdisciplinary team learning processes. However, group conflict is usually resolved by team members themselves, rarely does it get to the point where faculty intervention is required.

### Participating Disciplines

The disciplines represented in the Program are primarily health science schools and programs at the UNM Health Sciences Center (UNMHSC) campus. However, several students have joined the Program from other universities or community colleges within the state. The largest cumulative student representation in the Program is from the medical, pharmacy, physical therapy, nursing and respiratory therapy schools or programs (Table II). Over the nine-year period of its existence (1990 to 1999), the Program has trained

### Table II. Participating disciplines, institutions, and student participation in the Interdisciplinary Health Care for Rural Areas Training Program 1990-1999

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Institution</th>
<th>Number of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicine</td>
<td>UNMHSC(^a)</td>
<td>69</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>UNMHSC</td>
<td>65</td>
</tr>
<tr>
<td>Physical Therapy</td>
<td>UNMHSC</td>
<td>44</td>
</tr>
<tr>
<td>Nursing</td>
<td>UNMHSC</td>
<td>26</td>
</tr>
<tr>
<td>Respiratory Therapy</td>
<td>Albuquerque TVI(^b)</td>
<td>26</td>
</tr>
<tr>
<td>Dental Hygiene</td>
<td>UNMHSC</td>
<td>20</td>
</tr>
<tr>
<td>Medical Laboratory Science</td>
<td>UNMHSC</td>
<td>17</td>
</tr>
<tr>
<td>Occupational Therapy</td>
<td>UNMHSC</td>
<td>16</td>
</tr>
<tr>
<td>Speech and Language Pathology</td>
<td>UNMHSC</td>
<td>15</td>
</tr>
<tr>
<td>Public Health</td>
<td>UNMHSC</td>
<td>2</td>
</tr>
<tr>
<td>Social Work</td>
<td>NMHU(^c)</td>
<td>1</td>
</tr>
<tr>
<td>Education</td>
<td>UNM(^d)</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total Number of Students</strong></td>
<td></td>
<td><strong>302</strong></td>
</tr>
</tbody>
</table>

\(^a\)The University of New Mexico Health Sciences Center, Albuquerque NM.

\(^b\)Albuquerque Technical Vocational Institute (Community College), Albuquerque NM.

\(^c\)New Mexico Highlands University, Las Vegas NM.

\(^d\)The University of New Mexico, Albuquerque NM.
302 health professions students in interdisciplinary, rural settings; including 65 pharmacy students. Table II shows the frequency distribution in numbers of students trained from the participating disciplines.

**Participating Rural Communities**

Five rural communities in the state of New Mexico serve as “target” communities for the rural community phase of the Program during the months of June and July: Farmington, Las Vegas, Roswell, Silver City and Torrance County (Figure 1). The communities are located in five different regions throughout the state: northwest, northeast, southwest, southeast and central. A pictorial representation of the participating target rural communities and other rural communities containing experiential pharmacy sites throughout the state is presented in Figure 1.

Students choose or are assigned to experiential sites in one of the five target rural communities or to an experiential site in a rural community that is within reasonable driving distance to the target community. Assignments to specific communities are based on site and/or preceptor availability and on the number of students requiring placement within a specific discipline. Student placement in the rural communities is usually warmly received. Of the 33 counties in New Mexico, 29 counties have been designated by the Federal Government as Health Professional Shortage Areas (HPSAs). Nineteen of the 33 counties in the state are classified as “frontier” counties (population density of less than seven people per square mile). The communities participating in the Program are also found in counties that represent areas of high poverty (from 14 to 27 percent of the county population at the poverty level) and contain a high percentage of ethnic minorities (from 39 percent to 80 percent of the county population), primarily Hispanic and Native American populations. Interdisciplinary health professions students placed in these rural settings have an opportunity to provide clinical services to populations who typically lack resources and access to health care.

**Faculty Roles**

Interdisciplinary faculty are encouraged to attend a two-day “Tutor Training and Case Development Workshop” offered by the Teacher and Educational Development department in the UNM School of Medicine in order to standardize faculty training in the PBL method. The interdisciplinary faculty are expected to role model and facilitate effective small group skills, interdisciplinary PBL problem solving methods and identification of learning issues in order to encourage students to develop interdisciplinary interests and competencies. Two interdisciplinary faculty members from different disciplines serve as facilitators for each interdisciplinary tutorial. The two faculty members facilitate the same interdisciplinary tutorial group through the two sessions required to complete one PBL case tutorial. For continuity sake, an attempt is made to have the same faculty facilitators with the same tutorial group for the on-campus and rural community phases. However, an interdisciplinary faculty member may work with a different interdisciplinary student tutorial group over the course of the on-campus or rural community program phases.

During the rural community PBL case tutorial sessions, at least one UNMHSC interdisciplinary faculty member (circuit rider) travels (up to 300 miles one way in some cases) to the rural community for that day’s case tutorial and to meet with preceptors and discipline specific students. The interdisciplinary faculty member’s presence provides academic support for students in the program and helps facilitate effective communication between the academic institution and the rural community. Local preceptors are invited to attend if their work schedules allow or if they have a special interest in the PBL case being presented that day. In some communities the local preceptors are alumni of the Program, which provides the advantage of having been trained in interdisciplinary processes and problem solving. Having local preceptors in attendance provides a local resource that is familiar with health problems and resources in the community.

**Community Coordinator Roles**

Another component of the Program that is crucial to its success is the community coordinator. An interested community member from each participating target community fulfills this role and is paid a nominal amount for their participation. The community coordinator’s responsibilities include: facilitating communication between the students, the Program and the community; coordination of student housing and arranging of meeting places while students are in the community, and the provision of information on community resources to students. The community coordinators are also responsible for organizing the community orientation to the Program.

**PHARMACY STUDENT PARTICIPATION IN THE INTERDISCIPLINARY HEALTH CARE FOR RURAL AREAS TRAINING PROGRAM**

The Program has been well received by students at The University of New Mexico College of Pharmacy. Pharmacy students comprise nearly 22 percent of all health professions students (65 of 302 students) that have participated in the Program. Pharmacy student participation has increased from one student at the inception of the program in 1990 to a high of 13 students participating in the 1997-98 academic year. Recently, a selection procedure was developed by the interdisciplinary pharmacy faculty member because of considerable pharmacy student interest in the Program and the requirement by the Program to limit the number of students in each community group to three students per discipline. Selection is based on students’ essays regarding their reasons for applying to the interdisciplinary program and interest and likelihood of practicing in a rural area upon graduation. Three non-pharmacy interdisciplinary faculty members then judge the essays and determine which students will participate.

The 1998-99 academic year marked the first time Doctor of Pharmacy (PharmD) students participated in the Program. Doctor of Pharmacy students enter the Program during the last didactic semester of the curriculum (year five of a six-year program). Before the 1998-99 academic year, all the participating pharmacy students were in the Bachelor of Science (BS) degree program.

Historically, BS pharmacy students were given academic credit of up to two credit hours (which could be applied toward professional elective credits) for their participation in the Program. In the Doctor of Pharmacy curriculum, students can sign up for two hours of academic credit, which documents their participation in the interdisciplinary program on their academic record. Students who choose to participate in the Program are given priority externships (BS degree program) or clinical clerkship rotations (PharmD degree program). Doctor of Pharmacy students are able to complete two of their nine required month long clerkships while participating in the Program.
Table III. Pretest/posttest results of student confidence in interdisciplinary training and interdisciplinary health care provision activities (1990-99)

<table>
<thead>
<tr>
<th>Confidence statementa</th>
<th>All students (n = 217)</th>
<th>Pharmacy students (n = 45)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean score (SD)</td>
<td>Mean score (SD)</td>
</tr>
<tr>
<td></td>
<td>Pretest</td>
<td>Posttest</td>
</tr>
<tr>
<td>How confident are you that:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>You could contribute input during a discussion of patient care with a team of health care practitioners?</td>
<td>80.88 (17.31)</td>
<td>89.91 (12.58)</td>
</tr>
<tr>
<td>You could contribute input into the development of a patient care treatment plan with a team of health care practitioners?</td>
<td>81.52 (17.02)</td>
<td>90.55 (12.04)</td>
</tr>
<tr>
<td>Participating in this program is/was an effective means of educating health professional students?</td>
<td>88.62 (15.21)</td>
<td>91.52 (11.71)</td>
</tr>
<tr>
<td>Participating in this program will improve/has improved your professional interaction skills?</td>
<td>92.77 (10.62)</td>
<td>92.12 (11.55)</td>
</tr>
<tr>
<td>Interdisciplinary team efforts are important to the care of patients that you serve?</td>
<td>93.78 (10.74)</td>
<td>95.62 (10.26)</td>
</tr>
<tr>
<td>You can identify the types of patients requiring interdisciplinary cooperation to achieve optimal care?</td>
<td>76.08 (19.76)</td>
<td>91.43 (10.64)</td>
</tr>
<tr>
<td>Participation in interdisciplinary educational activities will strengthen/has strengthened your ability for future practice?</td>
<td>92.86 (12.52)</td>
<td>93.18 (12.46)</td>
</tr>
<tr>
<td>You can contribute knowledge of your specific discipline for the purpose of interdisciplinary team problem-solving?</td>
<td>84.89 (15.96)</td>
<td>93.63 (9.42)</td>
</tr>
<tr>
<td>You can communicate effectively with other members of the interdisciplinary health care team?</td>
<td>83.36 (14.88)</td>
<td>93.23 (8.43)</td>
</tr>
<tr>
<td>You can conduct effective problem-solving utilizing the various resources of several types of health care personnel?</td>
<td>81.53 (16.37)</td>
<td>91.98 (9.49)</td>
</tr>
<tr>
<td>You can gain new information using self-directed learning activities?</td>
<td>90.14 (12.23)</td>
<td>93.66 (9.00)</td>
</tr>
</tbody>
</table>

a Responses on scale of 0 to 100%

b Significant at P ≤ 0.0045, Bonferroni corrected paired t-test.

EVALUATION

Evaluation of the Program has focused on three major areas: (i) program effect on student attitudes related to interdisciplinary concepts; (ii) PBL case tutorial content relative to the professional education needs of students; and (iii) retention and recruitment of Program alumni to rural areas.

The impact on student attitudes toward interdisciplinary concepts is measured using a questionnaire completed by participating students at the beginning and end of the Program. The pretest/posttest questionnaire measures changes in student confidence in areas such as interdisciplinary training, interdisciplinary health care provision, contribution to an interdisciplinary health care team and interdisciplinary problem solving abilities (Table III). The questionnaire also measures whether student tendencies to consult with other health-care professionals change as a result of the Program. Finally, the questionnaire measures changes in student attitudes concerning the importance of different health care provider interactions to patient welfare.

Paired t-tests were conducted to determine changes in all student participants’ confidence scores between the start (pretest) and completion (posttest) on the Program (Table III). A separate statistical analysis was conducted to determine pretest and posttest differences in pharmacy students’ confidence scores. Given the 11 pairwise comparisons, statistical significance was determined at the Bonferroni corrected P value of less than or equal to 0.0045. All statistical analyses were conducted using the Systat 8.0 software package(18).

As shown in Table III, confidence scores in the ability to provide interdisciplinary health care, to contribute knowledge of their specific discipline for interdisciplinary problem solving, to communicate effectively in a team and to use self-directed learning and problem solving skills increased in students from all disciplines. There were statistically significant increases in scores for seven of 11 confidence statements between pretest and posttest administrations for all students. Positive changes between pretest and posttest confidence scores were seen for all students in 10 of 11 confidence statements. Statistically significant changes in pharmacy students’ confidence scores were found in six of 11 statements. Mean differences between every pretest and posttest confidence score for pharmacy students were in a positive direction.

While the results reported in Table III show positive changes in participants’ confidence scores, there are potential limitations with this evaluation design. Since students self select into the program, the pretest confidence scores are high. Participating students may have higher expectations of their confidence to provide interdisciplinary care than a group of their peers not selecting to participate in the Program. However, given this limitation, that fact that students’ confidence scores still significantly increased (despite the elevated pretest scores) provides evidence of the Program’s impact on student confidence.

A frequently voiced concern is whether the content of the PBL case tutorials contributes to the educational mission of the respective school or discipline. A case evaluation process addresses whether or not and how much each discipline was adequately represented during the course of the tutorial. Students are required to complete a case evaluation form at the completion of each PBL case. The evaluation form requires...
students to indicate if the case had any errors, how well the case worked, what learning issues were identified, resources used to conduct the case, whether or not the case invoked interdisciplinary issues and any additional discipline specific issues that would be appropriate for the case. A review of nearly 100 cases found that: (i) cases represented a variety of diseases, resources and issues; (ii) all disciplines in the group were represented in the cases; (iii) cases reflected a serious effort to follow the guidelines suggested for their development [Appendix A]; and (iv) materials presented, discussed, and distributed were of high quality and consistent with contemporary information.

Finally, it is difficult to evaluate the full impact the Program has had on the choices health professions students make related to professional practice in rural areas. Other factors in addition to the Program may influence students’ choice of practice settings. Many students may choose to practice in rural areas because they were raised in rural areas. Some students may be returning to rural hometowns to practice. Others may practice in rural areas to satisfy loan repayment requirements. Many students are still completing additional education or residencies and may have not entered the work force. These other extraneous factors also need to be taken into consideration when performing a longitudinal outcomes analysis of Program participant placement in rural or under served areas.

A crude evaluation of practice setting outcomes for the first nine years of the Program shows that, 38 of 302, or 13 percent, of Program graduates have been employed in rural or under served areas within New Mexico following graduation. Ten of 65, or 15 percent, of pharmacy students trained in the Program have taken pharmacist positions in rural areas. Several Program graduates also work in rural communities outside the state of New Mexico. These confirmed placements are probably an underestimate, as contact with many Program graduates has proven difficult. A longitudinal follow-up study using a control group of students not participating in the Program is being conducted to evaluate the question of rural placement, retention and employment.

DISCUSSION

Our nine-year experience in the interdisciplinary training of pharmacy and other health professions students in rural areas has been very educational and rewarding. First, the Program has provided health professions students an exciting and innovative method of learning. The Program provides students a practice model that attempts to incorporate as many of the health care team players as possible as opposed to the traditional unidisciplinary training models found throughout most individual discipline programs. The use of the PBL case tutorials has been an effective method in providing an interdisciplinary, team, and student centered approach to solving patient problems. Students have expressed their appreciation for the Program’s ability to provide an eye opening experience as to roles and knowledge of other health disciplines. Students and faculty preceptors alike frequently comment about gaining a new respect for other disciplines and how the contribution and strengths of each discipline are joined together in solving patient problems. Student confidence in their abilities to render interdisciplinary care has also been positively and significantly impacted.

Second, although formal evaluation data related to the impact the Program has had on faculty participants is not routinely collected, the Program has fostered many personal and professional rewards. The process of observing, and participat-
Interdisciplinary education may result in many benefits for both students and faculty alike. These benefits include the fostering of interprofessional relationships between health-professional students of different disciplines with the intent to improve interprofessional relationships once students enter practice. Similarly, for faculty involved, the interdisciplinary collaboration allows for meaningful professional relationships with faculty from other health-related disciplines and allows one to step out of one’s own discipline.

Pharmacy student participation in this rural, interdisciplinary health care training program has resulted in positive and significant changes in pharmacy student confidence to provide interdisciplinary care (Table III) and in positive outcomes related to the number of pharmacy students trained in interdisciplinary settings as well as in the recruitment of future pharmacists to practice in rural areas. Thirteen percent of all participating students and 15 percent (10/65) of the pharmacy students chose rural or under served practice areas following graduation.

Conclusio
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References

Appendix A. Guidelines for Developing Interdisciplinary Cases
Cases should incorporate at least 3 or 4 professional dimensions (i.e., discipline perspectives)
• Content should allow for discussion of these dimensions (e.g., broken legs vs. skin lesion)

Cases should incorporate public and social aspects of health issues.
• Opportunity for students to discuss economic issues, legal issues, public policy and management issues not directly related to medicine.

Cases should insure that prevention and health promotion are addressed on two levels of care.
• Individual (e.g., lifestyle changes).
• Policy (e.g., professional responsibility).

Cases should address a continuum of care:
• Individual - family - community - public policy.

Cases should be developed by 2 or 3 students from different disciplines who will also facilitate the case.

Process of developing cases should facilitate and promote:
• Communication
• Cultural
• Interprofessional
• Interaction
• Understanding
• Appreciation
• Creative interdisciplinary problem solving
• Collaboration
• Negotiation
• Conflict resolution
• Role identity
• Group process
• Consensus building

Cases should be constructed to promote all of the above by incorporating various methods, including:
• Questioning
• Case descriptions
• Exhibits
• Computer technology

Matrix
Students will construct cases within this matrix of guidelines. It will be up to them to identify how they will meet the guidelines in developing cases.

*Developed by Darlene Hess, Ph.D.,CNP, Interdisciplinary Program Faculty.
APPENDIX B. ABBRIVIATED CASE EXAMPLE

MY TEETH HURT

Situation: You are seeing a new patient, Mrs. Blass, at your clinic. She was referred to you by the local ER where she was treated after an auto accident.

History: Hit teeth on steering wheel.

- Was drinking while driving.
- Uses inhalers for asthma.
- Wants pain medication.
- Lives with elderly mother.
- Is a Navajo Native American.
- Is unemployed.

Observations: Cracked teeth
- Neatly dressed.
- Appears angry.
- Ruddy complexion.
- Wheezing/Peak flow-200.
- Enlarged liver.
- Slight tremor.

Discussion: Assessment and additional information needed
- List problems and causal hypothesis.
- Develop learning issues from above information.
- Discuss roles of different disciplines.
- Plan demonstrations-Respiratory testing.
- Arrange interview- Alcoholics Anonymous.
- Plans for visit to an Elderly Home Program.

*Developed by Nurse Practitioner, Respiratory Therapy, Medical and Pharmacy students on February 23, 1996, Silver City, New Mexico.