

Interdisciplinary health professional education in rural New Mexico: a 10 year experience

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Abstract

The New Mexico Rural Health Interdisciplinary Program was initiated in 1990 to meet the need for interdisciplinary health professional student training and to advance the recruitment and retention of health professionals in rural healthcare shortage areas. This paper describes the New Mexico programme, including its interdisciplinary problem-based learning format and mechanisms for generating community involvement, and reports the evaluation findings and lessons learned from 10 years of programme experience. The New Mexico programme utilizes student-centred, problem-based learning (PBL) as an educational format and currently involves 12 healthcare disciplines in six communities throughout the state. Evaluation has focused on differences in student attitudes about and confidence in interdisciplinary and rural practice prior to and upon completion of the programme, as well as change in student expectations of consulting with other health professionals. A pre-test/post-test survey was used to assess change. The growth of the programme provides some evidence of its success. Results indicate a consistent change in attitude of participants towards greater confidence to work in rural settings and with interdisciplinary teams and an increased expectation to consult with other healthcare professionals. The lessons of this 10 year training experience include the compatibility of PBL to an interdisciplinary training model, the importance of scheduling to facilitate optimal participation, the need for a dedicated core faculty, the worth of informal as well as formal interdisciplinary student interaction, the need to cultivate community relationships and support and the challenge of programme evaluation.

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Introduction

Healthcare reform initiatives in the United States call for an increased emphasis on generalist and primary care orientations as well as community partnerships. To help meet the challenges presented by a changing healthcare system, the Pew Health Professions Commission (1995) recommended the redesign of health professional education to integrate the training of health professionals, explore their various roles and promote team competencies. Typically, however, the education of health professionals does not reflect their interdependent roles. A 1995 survey of 35 academic health centres that contained both nursing and medical schools found that only 14% hosted one interdisciplinary course; most of these were offered as electives (Larson 1995). The assumption underlying interdisciplinary training efforts is that future healthcare providers can benefit from training that allows them to understand and value the roles and skills of other practitioners alongside whom they will be working. Knowledge and appreciation of the expertise that each health discipline brings to solving patient problems may produce more effective participants in interdisciplinary patient care.

Interdisciplinary didactic offerings reported in the literature include lectures, seminars, problem solving and other small group learning tasks, and interprofessional team-taught courses [Brandt 1997; Duerst *et al.* 1997; Health Science Partnerships in Interdisciplinary Clinical Education (HSPICE) 1999, 2001; Slack & McEwen 1993; LaSala *et al.* 1997]. Experiential activities include observations of other healthcare practitioners and functioning interdisciplinary teams, daily interaction of students with professionals from other disciplines providing patient care, linked or joint community site placements, interviewing patients together, discussion and development of patient care plans, presentation of in-services by students to staff and students of other disciplines, conducting interdisciplinary needs assessments and designing and implementing service-orientated projects (Brandt 1997; HSPICE 1999, 2001; Gallmeier & Bonner 1992; Slack & McEwen 1993; Larson 1995; Duerst *et al.* 1997; LaSala *et al.* 1997).

Interdisciplinary training efforts with varying components, disciplines and objectives are difficult to assess. Programme evaluation commonly measures participant satisfaction. While the nature of these programmes often precludes rigorous analysis of their results, outcomes have on the whole been very positive. Students have noted gains in knowledge, development of team-building skills, increased knowledge of other disciplines and opportunities for consultation and increased awareness of the social aspects of working in interprofessional teams. Student attitudes about interdisciplinary training programmes have been affirmative, with students frequently citing the benefits of interacting with and learning about other health professionals and working with an interdisciplinary team (Brandt 1997; HSPICE 1999; Fagin 1992; Slack & McEwen 1993; Duerst *et al.* 1997; Harris *et al.* 1998). Also of note is some indication of benefit to the communities and the health status of the patient populations served (HSPICE 1999; Slack & McEwen 1993). Fink reports numerous studies, including one randomized controlled clinical trial, that suggest beneficial healthcare outcomes from collaboration between nurses and physicians in practice (Fagin 1992).

Slack & McEwen (1993) describe a three credit-hour graduate-level class followed by a 10 week practicum in which 25 students in medicine, nursing, healthcare administration, social work and pharmacy worked in teams on community projects that spanned 2 years in three rural Arizona communities. Evaluation outcomes included substantial gains in student ratings of team functioning and in self-report of ability to work with other disciplines. Learning group process was cited as the most valuable aspect of the experience. Fourteen student participants were employed in some capacity in or with rural communities at the end of the second year.

The HSPICE project at the University of Washington uses a clinical education interdisciplinary model, which presents the opportunity for interdisciplinary clinical interaction as well as patient case discussion (HSPICE 1999, 2001). Students of dentistry, nursing, medicine, pharmacy, public health, physician assistant and social work are brought together with faculty and practitioners at

an urban-community-orientated medical facility. The addition of library and information science students to the interdisciplinary teams incorporates information management and training support. HSPICE offerings include case-based seminars, credit problem-based learning (PBL) courses and community service projects. Students who participated in the PBL seminar course showed a positive change in attitude towards interdisciplinary work, community-based care and the need for interdisciplinary educational opportunities, indicating consideration of a broader range of health careers following their participation. HSPICE (1999) also reports indications of a positive impact on the clinical populations served, such as improved discharge rates at a rehabilitation centre, postulated by staff to be because of interdisciplinary student initiatives.

Due to the variety and transient nature of interdisciplinary programmes, difficulty in comparing results and the lack of valid, reliable and stable evaluation tools, many questions remain unanswered. Which components of interdisciplinary training programmes are most effective in training health professionals? Are these programmes effective in promoting the skills requisite to interdisciplinary practice? Does interdisciplinary education produce students who are interested in and capable of collaboration in actual practice settings?

In addition to these issues of interdisciplinary training and practice are concerns across the USA regarding the shortage of health professionals in rural communities (LaSala *et al.* 1997). As an example, the need for health personnel is acute throughout the state of New Mexico, reaching crisis proportions for specific disciplines in some counties. New Mexico is sparsely populated, with 15 of its 33 counties designated as frontier (population density of less than six people per square mile) and 12 as rural (less than 100 people per square mile). In addition, New Mexico has a high proportion of poor and underserved populations. The state's ethnic distribution is 48% Caucasian, 40.3% Hispanic and 9.4% Native American. In January 2000, 26 of the 33 New Mexico counties contained primary care health professional shortage areas (HPSAs), and 22 were designated as dental HPSAs (New Mexico Department of Health 2000).

With the primary goals of training health professional students in an interdisciplinary setting and of making rural practice a more attractive career choice for students, the New Mexico Rural Health Interdisciplinary Program ('the programme') was started in 1990 with a grant awarded by the US Department of Health and Human Resources, Health Resources and Services Administration. The programme is based upon the premise that community healthcare is optimized by facilitating and modelling the dynamics of case management and interdisciplinary decision-making. Additionally, experiences in rural communities that demonstrate and nurture professional interdisciplinary relationships within a collegial atmosphere are intended to increase the recruitment and retention of healthcare practitioners in rural areas.

This paper describes our 10 years of experience in training healthcare professionals to provide interdisciplinary care via a programme that utilizes small-group, student-centred, problem-based learning in rural communities throughout the state of New Mexico. This paper also presents evaluation results, summarizes the lessons learned over the course of 10 years and defines the components of interdisciplinary training models that are associated with success.

Programme description

The New Mexico Rural Health Interdisciplinary Program began in 1990 with five participating disciplines from the University of New Mexico Health Sciences Center (UNMHSC) – medicine, physical therapy, nurse practitioner/nurse midwife, pharmacy and respiratory therapy. The programme has grown to include other local colleges and the additional disciplines of dental hygiene, medical laboratory science, occupational therapy, masters in public health, bachelors and associate degree nursing, social work, physician assistant and speech-language pathology (Borrego *et al.* 2000). Participating students are at different points in curricula of varying lengths. Most students (occupational and physical therapy, speech-language pathology, dental hygiene, medical laboratory science and pharmacy) are in their final year, while

medical and physician assistant students are usually in their first year of study, and nursing students have been involved from associate degree through graduate levels. Respiratory therapy students graduate with an associate degree mid-way through the interdisciplinary programme.

Yearly schedule

Recruitment and selection of students occurs during the fall semester. Student participation is voluntary. A November orientation outlines programme logistics and expectations, and students form teams based on their preference for one of six New Mexico sites, five of which are rural. Site selection usually dovetails with anticipated summer experiential training locations. Typically, it takes 2–3 months for the self-selection process – influenced by clinical placement availability, community need and the programme's desire for a broad mix of disciplines in each group – to solidify the membership of each interdisciplinary site team.

From January to March, each team meets weekly on campus with faculty facilitators in PBL tutorials. A pre-test survey is administered to all student participants immediately prior to the first tutorial session. The initial faculty-developed case models case development and facilitation. A case development workshop with written guidelines on case construction is provided. Small interdisciplinary groups of two to three students within each team then develop cases, drawing from their academic and clinical experiences, with instruction to include patient or community problems representative of most or all disciplines. Student authors then facilitate the tutorials in which their cases are discussed.

In April, an orientation in each rural community introduces the programme and its current students to their preceptors and to the community. The off-campus rural component of the programme occurs in June and July, during which time most students simultaneously fulfil discipline-specific practicum requirements. Student teams resume meeting weekly in half-day tutorial sessions. A post-test survey is administered to students at the final tutorial session in July. E-mail and computer link-ups to library resources enable students to access resources

at UNMHSC while in the rural community and allow students, faculty and preceptors to communicate with each other. Students are provided with modest stipends for housing and travel expenses.

Interdisciplinary problem-based learning

The traditional (hypothetico-deductive reasoning) PBL model begins with a patient presentation, asks for the generation of patient problems and hypotheses to explain them, explores mechanisms underlying hypotheses and identifies questions or learning issues. Information is then collected to answer questions, clarify hypotheses and select a best solution. The traditional PBL model, well suited to medical diagnosis, has evolved over the years to better meet the needs of the interdisciplinary setting (Moore-West & O'Donnell 1985; Bruhn 1997; Urbina *et al.* 1997).

Objectives in interdisciplinary tutorials are more process- than content-orientated. Process objectives include the advancement of the team concept, fostering respect among team members, consideration of social, behavioural and population issues and student development of case-management competencies. During the tutorial discussion, students are encouraged to explain and demonstrate their discipline-specific information, reasoning, equipment, scope of practice and role in patient or community care as they relate to the clinical, social and economic issues raised by the case. Equal importance is given to each discipline's contribution to the group's knowledge base and problem-solving process. Since there is no prescribed curricular content, tutorial groups become particularly student-driven. Students become empowered as they determine what and how learning is pursued.

Another facet of interdisciplinary PBL is a shift in focus towards finding common footing among disciplines, as opposed to exploring the depths and limits of each student's knowledge. The programme encourages the use of a variety of resources to address learning issues, including community experts, practitioners and students of other disciplines, as well as library resources and information technology. Active learning experiences, such as field trips, patient interviews or demonstrations of techniques or equipment, are common. As in most traditional

PBL formats, emphasis is placed on asking useful, relevant questions, providing evidence to support answers and argument, teaching others and ongoing reflection and assessment.

Tutorial cases

Over 200 tutorial cases have been generated by interdisciplinary groups of students since the programme inception. A preliminary review of 60

cases suggests that, independently of year or location, patient characteristics, diagnoses and learning issues are consistent and reflect common and important issues in New Mexico healthcare. Patients depicted in tutorial cases are distributed broadly in terms of age, ethnicity and occupation. Behavioural and social issues, such as alcoholism, domestic violence, community resources and ethics, as well as age-related and rural health issues, are well-represented in case discussions. Figure 1 illustrates

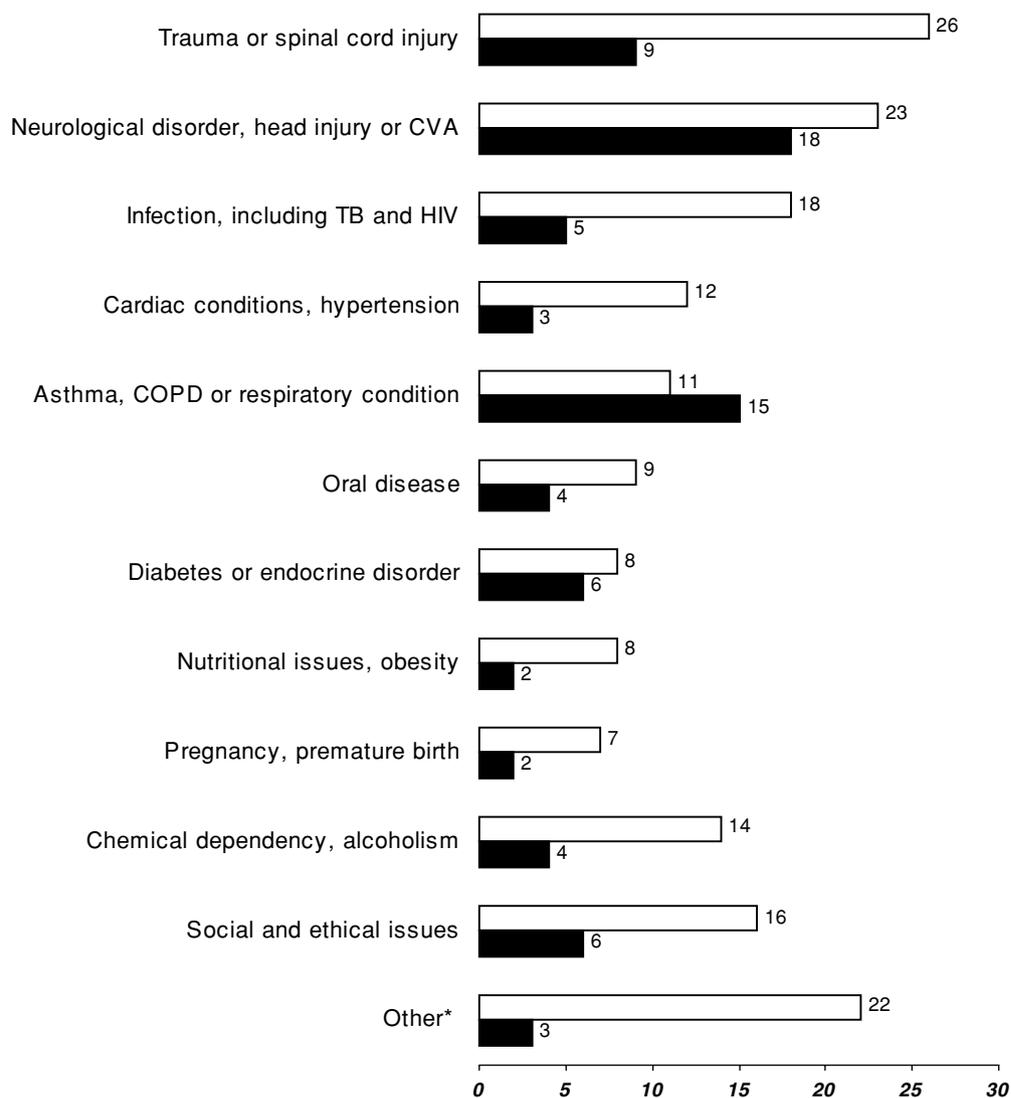


Fig. 1 Diagnoses and conditions explored in interdisciplinary PBL cases. The most common diagnoses and conditions of patient problems (open bar) and conditions explored as learning issues (filled bar), with their frequency of occurrence in 60 student-generated PBL cases, are listed.

*Other conditions include amputation, arthritis, cancer, hip replacement, liver disorders, toxicity and psychological disorders.

diagnoses and learning issues explored in student-generated cases.

Community involvement

In each rural site, a community member serves as a paid community co-ordinator, who assists students in making the transition from the university setting to the local community. Community co-ordinators organize the spring rural site orientation, provide students with materials germane to the community, help students feel welcome and comfortable, encourage publicity for the programme and facilitate the smooth operation of the programme during its rural summer component.

The programme depends upon active collaboration with its community partners. The Farmington–Shiprock area in north-western New Mexico was chosen as the initial programme site. A community clinic in the area provided meeting facilities and identified a rural co-ordinator to support the first year of 11 student participants. Programme administrators met with the chief executive officers (CEOs) of both the area regional and Indian Health Service hospitals, who were spending large sums to recruit health professionals and having difficulty retaining them. The mutual goal of recruitment and retention of healthcare providers prompted the support of these hospital administrators.

Word of the programme was circulated through the New Mexico Hospital Association (an organization of hospital administrators), and invitations to connect were received from other communities. Meetings with regional hospital CEOs, as well as healthcare providers, public school officials, city leaders and representatives of community groups, elicited support for the expansion of the programme to each new site. All communities approached in this way provided meeting rooms, meals for students and library and computer access, as well as administrative backing to encourage staff to serve as clinical preceptors for students. Some supported the salary of the rural co-ordinator and provided housing facilities for students during the summer. The programme has reciprocated by providing educational sessions, computer training and equipment, as well as electronic access to UNMHSC resources for associated

clinical facilities and preceptors. These efforts are intended to help reduce the isolation of rural area clinical practice and make the community a more attractive professional site, thereby promoting the objective of health professional retention.

Faculty roles

The programme's steering committee, comprised of representatives from at least 10 disciplines, meets weekly to provide ongoing programme communication, guide policy and serve on the programme's various committees. Interdisciplinary faculty members recruit students into the programme, serve as PBL facilitators and mentors and arrange and monitor clinical rotations for students in the rural communities. Two faculty members from different disciplines facilitate each tutorial during the spring semester, modelling facilitation skills, providing feedback and making suggestions regarding group process and content. During the summer, as students assume greater ownership of the group process, faculty members in attendance provide communication between the students, the rural community and the programme and afford constancy and academic support.

Evaluation methods

To date, evaluation has focused on student confidence in and attitudes about interdisciplinary and rural practice. In addition, the programme has performed a preliminary review of PBL case content and followed the placement of programme graduates in rural under-served areas, as well as tracking student ratings of 'team effectiveness' within each small group and overall student satisfaction with the programme upon its completion.

Changes in student confidence and attitudes has been measured using a pre-test/post-test survey. Paired *T*-tests were performed to determine whether mean differences in scores from pre-test to post-test were statistically significant. Bonferroni's adjustment was used to correct for multiple (17) *T*-tests performed, resulting in an alpha level of 0.003 to assess statistical significance. A one-factor analysis of variance (ANOVA) was also performed to determine

if there were differences between disciplines in change of attitude from pre-test to post-test. Tukey's posthoc procedure was used to investigate specific pairwise differences between disciplines.

Results

The New Mexico Interdisciplinary Program has grown from 11 to 64 students per year, from five to 12 disciplines and from one to six regional sites encompassing 12 communities located throughout New Mexico. Over a 10 year period, 361 students have completed the 5 month programme, primarily in rural settings. Table 1 provides student participant demographic information.

The pre-test/post-test survey largely contains items that measure student confidence to participate in interdisciplinary patient care discussion, treatment planning and problem solving, as well as student confidence to practice in rural settings and to interact with patients from different cultures. Other items concern student attitudes about the programme and the importance of interdisciplinary care. The survey used an 11-point response scale ranging from 0 to 100.

Pre-test/post-test survey items remained stable over the first 9 years of the programme. Due to changes in programme character and evaluation focus, the survey became outdated and was revised in 2000. Analysis of data from 1990–1999 is presented in the remainder of this section. Of the 355 students who entered the programme during its first 9 years, 35 (9.9%) dropped out from the programme, 14 completed only a portion of the programme and 85 others did not complete either a pre-test or a post-test. Analysis was performed on the remaining 221 student surveys.

Despite high pre-test scores, a significant and positive change in attitude ($P < 0.05$) occurred in 13 of 17 items from pre-test to post-test (see Table 2). The four items that did not show significant differences concerned attitudes about interdisciplinary educational activities and the importance of interdisciplinary patient care, rather than student confidence in their own abilities. Three of these items also displayed the highest pre-test scores. The item showing the greatest change (15.2 points) was:

Table 1 Demographics of participating students, by discipline, 1991–2000 ($n = 361$)

	Number	%
Discipline		
Dental hygiene	28	8
Medicine	78	22
Medical laboratory sciences	19	5
Occupational therapy	22	6
Pharmacy	79	22
Physical therapy	48	13
Associate degree, RN-BSN and advanced practice nursing	33	9
Respiratory therapy	32	9
Speech pathology	16	4
Other ^a	6	2
Total	361	100
Gender		
Female	246	68
Male	115	32
Age		
20–24	90	25
25–28	82	23
29–37	87	24
> 37	71	20
Unknown	31	9
Ethnicity		
Non-Hispanic White	204	57
Hispanic	65	18
Native American	12	3
Other ^b	39	11
Unknown	41	11
Year of participation		
1991–1993	33	9
1994–1996	121	34
1997–1999	152	42
2000	55	15

^aOther disciplines: Masters in public health, physician assistant, College of Education, social work.

^bOther ethnicity: Asian, African-American, other.

'how confident are you that you can identify the types of patients requiring interdisciplinary co-operation to achieve optimal care?'

The ANOVA showed that attitude change was significantly different between disciplines for four

Table 2 Changes in mean scores from pre-test to post-test in student confidence in interdisciplinary and rural practice

<i>Confidence statement</i>	n	<i>Mean pre-test score</i>	<i>Mean post-test score</i>	<i>Difference, pre-test to post-test^a (95% CI)</i>
<i>How confident are you that:</i>				
1 You could contribute input during a discussion of patient care with a team of healthcare practitioners?	221	80.7	90.1	9.4 (6.9–11.8)
2 You could contribute input into the development of a patient care treatment plan with a team of healthcare practitioners?	221	81.3	90.7	9.4 (7.0–11.7)
3 You could assist a patient in obtaining healthcare in a rural community?	221	76.1	85.8	9.8 (6.6–12.9)
4 You could identify cultural differences that exist in patients from a rural community?	220	77.0	87.0	10.0 (7.4–12.6)
5 You could communicate health information to a patient in a rural community who cannot speak English?	221	49.5	64.3	14.8 (11.0–18.7)
6 Participating in this programme is/was an effective means of educating health professional students?	221	88.8	91.9	
7 Participating in this programme will improve/has improved your professional interaction skills?	221	92.8	92.4	
8 You can identify the differences that exist between rural and urban healthcare systems?	221	73.9	88.2	14.3 (11.2–17.3)
9 You will be able/were able to influence the content and course structure of this programme?	220	73.2	79.7	6.5 (3.3–9.6)
10 Interdisciplinary team efforts are important to the care of patients that you serve?	221	93.6	95.6	
11 You can identify the types of patients requiring interdisciplinary co-operation to achieve optimal care?	221	76.0	91.2	15.2 (12.5–18.0)
12 Participation in interdisciplinary educational activities will strengthen/has strengthened your ability for future practice?	221	92.9	93.3	
13 You can contribute knowledge of your specific discipline for the purpose of interdisciplinary team problem-solving?	218	84.7	93.7	8.9 (6.8–11.1)
14 You can communicate effectively with other members of the interdisciplinary healthcare team?	221	83.1	93.4	10.3 (8.3–12.3)
15 You can conduct effective problem-solving utilizing the various resources of several types of healthcare personnel?	220	81.1	92.0	10.9 (8.7–13.1)
16 You can gain new information using self-directed learning activities?	220	89.9	93.6	3.7 (1.9–5.5)
17 You can interact effectively with patients from different cultures?	102	76.1	85.6	9.5 (6.0–13.0)

^aItems listed showed significant differences from pre-test to post-test, $P < 0.05$, Bonferroni corrected paired T -test with cut-off at $P < 0.003$.

of the 17 items ($P < 0.05$). For this analysis, the rehabilitation therapies of physical therapy, occupational therapy and speech-language pathology were grouped together as rehab therapy, medicine and pharmacy were each considered distinct disciplines and the other disciplines were combined as the other

therapy group. Table 3 presents the mean differences in pre-test to post-test scores by discipline for the four items. The other therapy group (consisting of respiratory therapy, dental hygiene, medical laboratory science and nursing) showed significantly smaller changes in scores from pre-test to post-test

Table 3 Mean differences in pre-test to post-test scores by discipline^a. Mean pre-test–post-test scores given in parentheses; differences in bold

<i>Confidence statement</i>	<i>Rehab therapy</i> (n = 63)	<i>Medicine</i> (n = 51)	<i>Pharmacy</i> (n = 49)	<i>Other therapy</i> (n = 55)
<i>How confident are you that:</i>				
You could assist a patient in obtaining healthcare in a rural community? (item 3)	(67.8–83.3) 15.6*	(72.9–85.7) 12.7	(82.2–90.0) 7.8	(82.9–85.6) 2.7*
You could identify cultural differences that exist in patients from a rural community? (item 4)	(69.5–86.7) 17.1*	(72.4–83.9) 11.6**	(81.3–90.2) 9.0	(85.6–87.6) 2.0*,**
You can identify the differences that exist between rural and urban healthcare systems? (item 8)	(63.8–87.6) 23.8*	(72.2–84.7) 12.5	(77.8–91.2) 13.5	(82.4–88.9) 6.5*
You can identify the types of patients requiring interdisciplinary co-operation to achieve optimal care? (item 11)	(73.0–94.3) 21.3*	(72.4–87.8) 15.5	(74.7–90.4) 15.7	(82.5–91.6) 9.1*

^aRehab therapy includes physical therapy ($n = 40$), occupational therapy ($n = 13$) and speech-language pathology ($n = 10$); Other therapy includes respiratory therapy ($n = 16$), dental hygiene ($n = 11$), medical laboratory science ($n = 11$) and nursing ($n = 17$). Social work, education and public health professionals (MPHs) were omitted from this analysis due to small sample sizes.

*,** indicate significant pairwise differences using Tukey's posthoc procedure ($P < 0.05$).

when compared with the rehab therapy group on all four items, and when compared to medicine on one item. A minor strength of association ($\eta^2 = 0.05–0.09$) was found for these results. It is noteworthy that no significant differences were found within the rehab therapy group – that is, between the disciplines of physical, occupational and speech therapies – nor were any pairwise differences found between the disciplines of medicine and pharmacy.

The pre-test and post-test surveys also measured change in student expectation to consult with other health professionals. During 1997–1999, this question was worded as follows: 'as you anticipate or currently practice in your profession today, how often would you/do you consult with the following professionals?' A five-point response scale ranged from 'never' to 'daily'. Because responses could be influenced by degree of exposure, an additional response category of 'no experience with profession' was given. A total of 199 responses on the pre-test indicated no experience with one of the 13 listed professions. Of these, 185 (93%) on the post-test changed to some other response category indicating experience with this profession. Table 4 compares

pre-test and post-test scores, indicating change in frequency or anticipated frequency of consultation. There were significant differences from pre-test to post-test denoting the expectation of greater frequency of consultation with nine of the 13 listed health professions ($P < 0.05$).

Discussion

Interpretation of results

The growth of the programme and its continued positive support provide evidence of its success. Analysis of pre-test to post-test differences in student surveys indicates a consistent change in attitude of programme participants towards greater confidence to work in rural settings and with interdisciplinary teams (see Table 2). Changes in scores from pre-test to post-test also denote a greater expectation to consult with other health professionals following programme participation, suggesting a change in how participating students may practice in the future.

Of interest are differences, and also the lack of differences, between disciplines in their attitude change

Table 4 Student expectation to consult with other health professionals: 'as you anticipate or currently practice in your profession today, how often would you/do you consult with the following professionals?' (1997–1999)

<i>Profession</i>	<i>Change in frequency of consult^a (95% CI)</i>	<i>n</i>	<i>P-value^b</i>
Nurse practitioners	0.4 (0.0–0.7)	79	0.03
Nurse midwives	0.4 (0.1–.07)	67	0.02
Pharmacists	0.2 (0.0–.04)	87	–
Physical therapists	0.4 (0.2–0.7)	85	< 0.01
Physicians	0.3 (0.1–0.5)	97	0.01
Respiratory therapists	0.3 (0.0–0.6)	87	0.04
Occupational therapists	0.5 (0.2–0.7)	84	< 0.01
Registered nurses	0.3 (0.1–0.6)	90	0.02
Social workers	0.3 (0.0–0.6)	81	–
Speech pathologists	0.2 (0.0–0.5)	81	0.02
Dental hygienists	0.3 (0.0–0.5)	79	0.04
Public health professionals (MPHs)	0.2 (–0.1–0.5)	70	–
Medical laboratory technicians	0.1 (–0.3–0.4)	79	–

^aMean change in frequency of consultation from pre-test to post-test for those students that indicated some frequency of consultation with the profession on the pre-test.

^bP-values indicate a significant difference between pre-test and post-test values using a paired *T*-test ($P < 0.05$).

measures from pre-test to post-test. Greatest variation was seen between disciplines that are typically grouped together under the umbrella of allied health, with minimal differences seen between medicine, pharmacy and rehabilitation therapies. Only one item ('how confident are you that you could identify cultural differences that exist in patients from a rural community?') revealed differences between the other therapy group and medicine. The reason for these distinctions is most likely to be related to the high pre-test scores of the other therapy group.

Limitations of our results and analysis include the lack of reliability data for evaluation instruments and the lack of a control group. High pre-test scores also obscure evaluation findings. Participants, who volunteer for the programme, probably begin with a belief in the concept of interdisciplinary care and an interest in rural health practice. Students completing a programme in which they have invested substantial time and effort would be more likely to indicate greater confidence on the post-test, endorsing their investment. The absence of a control group makes pre-test to post-test changes difficult to interpret.

Educational format

The current healthcare environment imposes the need to develop healthcare practitioners who can work with difficult, complex patient and community problems, who are able to consider a client's whole-life situation and who can critically evaluate the rapidly expanding body of information affecting clinical practice. Philosophically and theoretically, PBL concepts and methods may foster these skills (Bruhn 1997; Moore-West & O'Donnell 1985). Our experience and results suggest that student-centred problem-based learning is well suited to an interdisciplinary training model.

Tutorials provide a forum for students to ask questions of and provide information and resources to each other, thereby familiarizing all group members with each other's disciplines. Students and faculty have expressed that the programme has helped them gain respect for the role and contribution of other disciplines, and that these contributions intersect to enhance solutions to patient problems. That several issues and diagnoses typically arise within

the same case suggests the potential for predictable in-depth multidisciplinary discussion. Case discussions may uncover more than one possible approach to a patient problem, or a creative solution that transcends the expertise of any single discipline. Most importantly, interdisciplinary cases promote a mutual search for solutions to complex biological, social, cultural, ethical, legal, economic and treatment issues.

Student facilitation of their cases provides the opportunity to practice small group facilitation with interdisciplinary team members. Case discussions, first of the patient problem, then of the learning issues created in the initial discussion, cultivate skills in group dynamics, communication and conflict resolution, skills integral to today's practice environment.

Lessons learned

During the past 10 years, important lessons have been learned, many of which echo the assertions of other interdisciplinary training efforts. One lesson, frequently mentioned in the literature, is facilitation of the participation of involved disciplines by scheduling, so that students of each discipline are fulfilling discipline-specific requirements, usually practicum requirements, while participating in the programme (Shepard *et al.* 1985; Larson 1995; Duerst *et al.* 1997; Harris *et al.* 1998). This programme meets on Friday afternoons, a time of least potential conflict with other classes. Consistently maintaining this time has eventually established it as an interdisciplinary time for both students and faculty. The availability of students during the summer months to migrate off campus to a rural site has been more problematic. An example is the limited participation of nursing students, who, unlike the rest of the Health Sciences Center, are on a 9 month schedule and therefore are often unable to complete practical experiences during the summer months. Persistent faculty effort to overcome this barrier has recently evolved a potential solution of creating paid nursing externships in rural communities, so that nursing students may have cause and ability to participate. Collaboration to generate these types of solutions has required support at the higher administrative level of each school or college,

and practical support from faculty members who schedule practicum experiences, give credit in their classes and have interest in solving difficult problems.

Another key factor, also frequently mentioned by other interdisciplinary programmes, is the need for a dedicated core faculty (Larson 1995; Fagin 1992; Gallmeier & Bonner 1992; Brandt 1997; Duerst *et al.* 1997; Urbina *et al.* 1997; Harris *et al.* 1998). Collaboration is a sophisticated behaviour, one that is rarely addressed in health professional education. Consistent involvement of at least one faculty member from each discipline enables the programme to work logistically and models interdisciplinary collaboration to students. Faculty interaction fuels the programme and guides it forward; just as importantly, it allows the programme to be sensitive to the needs of each discipline. The balance between honouring individual discipline autonomy and needs vs. finding mechanisms for shared time and effort is integral. Over the past 10 years, the programme has fostered interaction and meaningful collaboration between faculty from different colleges and departments that would not have occurred otherwise and has provided a needed arena for interdisciplinary interaction on the UNMHSC campus. The programme provides a small amount of compensation to each participating discipline to offset the expense of its faculty contribution. The participation in and facilitation of interdisciplinary team relationships is generally found by the core faculty to be a reward in itself.

A third factor in success is opportunity for both formal and informal interdisciplinary student interaction. In formal contact, students can share discipline roles and responsibilities, gain knowledge and skills from one another and acquire value for interdisciplinary interaction. It has been noted that informal interaction and socializing help to establish trust and foster team development (Duerst *et al.* 1997; Slack & McEwen 1993). Our experience echoes this finding. Students' travelling and often living together truly augments the formal interdisciplinary experience. Actively doing things together appears to facilitate bonding and appreciation at a level more convincing than the intellectual. As effort towards a mutual goal is one of the hallmarks of interdisciplinary collaboration, the provision of

interdisciplinary team goals facilitates this process. The interdisciplinary groups participate to varying degrees in community service projects, which bring students together with a common intent. That students from different disciplines work together to develop and facilitate cases is valuable in offering an additional forum for interdisciplinary problem-orientated co-operation. This task encourages students to consider other discipline perspectives, while it provides these small interdisciplinary groups with an active experience towards a mutual goal. Mechanisms of formal and informal communication and interaction, such as group projects, e-mail communication, teleconferencing, barbecues and swimming parties, allow students to develop connection and trust, and need to be provided and nurtured.

Another issue is the importance of sequencing experiences so that students have developed a professional identity before participating in interdisciplinary education (Shepard *et al.* 1985; Gallmeier & Bonner 1992; Duerst *et al.* 1997; Harris *et al.* 1998). Discussion across disciplines can enhance professional identity, as well as socialize students negatively towards other professions (Harris *et al.* 1998). In our experience, concurrent with the development of professional identity comes a sufficient knowledge base within one's own profession to be able to contribute information and resources to others. Specific level of education beyond this appears inconsequential. In the New Mexico programme, graduate students successfully interact with associate degree students and no one discipline regularly dominates group discussions.

Community support is another key factor in the success of programme efforts. This includes interest and involvement of health facility administrators and key community stakeholders as well as clinicians and preceptors. This factor influences student attitude perceptibly. Students can sense community investment and welcome, which manifests as the extension of community resources like meals and meeting rooms, as well as a simple awareness of and interest in student presence. As an example, during the past academic year, students in the two group locations that had more conspicuous community support scored higher than did students in the two

groups that had less favourable community attention on all five items of the final satisfaction survey that assessed students' sense of belonging in, enjoyment of and interest in returning to work in their rural community.

An interdisciplinary group of a dozen students living for months in a small community also visibly impacts upon the community. Smaller communities that typically have the greatest health professional recruitment needs are often the most supportive of a programme with a shared objective. However, the community must be large enough to provide adequate student fieldwork assignments. One small community with which the programme is now attempting to build association provides enthusiastic support from hospital administrators. At the same time, it lacks sufficient breadth and availability of appropriate supervising clinicians to support student practicum experiences. A regional approach to rural community sites, incorporating several towns in one interdisciplinary team, has made their development possible.

Cultivation of community relationships is ongoing. Community members and state legislators are invited to community programme orientations. Some disciplines are able to offer continuing education credits to clinicians who attend interdisciplinary tutorials. The programme encourages and supports student involvement in community service projects such as health fairs and youth mentoring in liaison with existing community groups. The role of a paid community co-ordinator, who provides the mechanism by which students perceive the community and its support, is also critical. This person is a member of the community and knowledgeable about it. His or her presence supports the programme logistically and is a practical, and at times an emotional, support for students who are far from home or have never lived in a rural area. The community co-ordinator can also publicize the programme within the community and make community involvement and co-operation more accessible to visiting students.

The importance of adequate funds to support students is apparent (Gallmeier & Bonner 1992; Duerst *et al.* 1997). Stipends allow and entice student participation. The expense and uncertainty of

finding adequate housing often presents a barrier to student clinical placements in under-served areas. Financial support mitigates student insecurity. Also important are the social support inherent in the opportunity to seek living space together and guidance from a community co-ordinator in the task.

Finally, programme evaluation is a continuing challenge. There is a lack of usable, objective evaluation of the effectiveness and long-term outcomes of interdisciplinary programmes (Duerst *et al.* 1997; Harris *et al.* 1998; Slack *et al.* 2001). The reasons for this are many. Valid and reliable evaluation instruments in the realm of interdisciplinary training are lacking. Evaluation instruments and processes change to meet changing needs as programmes evolve, further undermining stable evaluation tools and efforts. Tracking students in a time of transition in their lives as they graduate from programmes and find employment is also problematic. Our programme would have benefited from a systematic tracking system that was in place at programme inception, as well as the design and piloting of evaluation instruments with content validity that were designed to evade typically high pre-test scores. A determined effort to tackle these complexities requires a significant initial and long-term commitment of programme funds and personnel.

Conclusions

We have presented one continuous and successful model of interdisciplinary health professional training, which uses PBL with a community-orientated format. Evaluation results suggest that the programme is providing students with skills for interdisciplinary clinical practice. A planned longitudinal study utilizing a control group will hopefully disclose further answers. It is our hope that this description of the New Mexico experience and the lessons learned from it will augment the field of interdisciplinary training and help to lessen the existing deficit in health professional education.

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