

## **A Pilot Study: The Design and Preliminary Evaluation of Web-based Materials to Teach Pharmacist-Physician Collaboration During Community-based Advanced Pharmacy Practice Experiences**

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### **Abstract**

**Objective:** To develop a pilot program consisting of 5 Internet-based educational modules to teach knowledge, attitudes, and skills relevant to developing relationships between pharmacists and physicians in the community and to evaluate these modules in a select group of student pharmacists completing advanced pharmacy practice experiences (APPEs) in community pharmacies.

**Methods:** Five Internet-based educational modules were developed in spring/summer 2008. Features of both published literature and currently unpublished research findings that describe relationships between pharmacists and physicians were used as a guide for module development. Three of the modules contained video- and audio-recordings of community pharmacists and their physician colleagues discussing their experiences with collaboration.

The educational modules were then evaluated in the fall of 2008 in a small group (n=6) of student pharmacists completing APPEs in community pharmacies. Outcome measures for this evaluation included student and preceptor satisfaction with the modules and their suggestions for improvement. Secondary outcomes were student attitudes towards collaboration and evidence of student knowledge and skill attainment.

Student satisfaction was assessed via an activity rating feature and 2 course evaluations. Preceptor satisfaction was evaluated through one course evaluation. Both evaluations also collected the users' suggestions for how to improve the modules. Student attitudes towards collaboration were assessed using a 14-item Likert-type scale adapted from the Interdisciplinary Education Perception and the Readiness of Healthcare Students for Interprofessional Learning Scales. Data on student knowledge and skill development were not collected.

**Results:** Students were most satisfied with Modules 3 (which featured a 40-minute video with 3 pairs of pharmacists/physicians sharing their experiences) and 4 (which featured one video of pharmacists and one video of physicians discussing their experiences in collaboration, with a focus on communication skills). Students' comments revealed that high satisfaction with these modules was due to the use of the

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video- and audio-recordings featuring “real relationships” between pharmacists and physicians. The preceptor respondent indicated overall satisfaction with the modules; however, he/she reported that inadequate time was available to discuss assignments with students. Problems with the Web site itself (e.g., requiring students to re-set their passwords frequently) were reported and perceived as a learning barrier.

Conclusions: Further assessments of the modules are needed in order to draw any conclusions on the impact of the learning materials on student attitudes, knowledge or skills. However, the ongoing use and further development of multimedia resources featuring examples of practicing professionals appears to be warranted.

Key words: interprofessional care, pharmacist-physician relationships, collaborative working relationships, community pharmacy, pharmacy education

## Introduction

The development of interprofessional teams to care for patients has been a key focal point for all health professionals. In 2002, leaders preparing for the Health Professions Education Summit specifically named the ability to work in interprofessional teams as one of 5 key competencies required for health professionals.<sup>1</sup> Further, recent reports released from the Institute of Medicine acknowledge a need for improved “cooperation among clinicians” as one strategy for addressing the inadequate clinical outcomes and unacceptable number of medical errors that occur throughout the United States.<sup>2</sup> The development of collaborative working relationships<sup>3</sup> between pharmacists and physicians is one example of cooperation that is essential.

For pharmacy educators, this commitment to interprofessional practice is evident in the 2004 Educational Outcomes released by the American Association of Colleges of Pharmacy (AACP) Center for the Advancement of Pharmaceutical Education (CAPE). The first CAPE outcome states that pharmacists will “communicate and collaborate with prescribers, patients, caregivers, and other involved health care providers to engender a team approach to patient care.”<sup>4</sup> Further, these goals reflect the vision set forth by the Joint Commission of Pharmacy Practitioners for Pharmacy Practice in 2015.<sup>5</sup> In 2007, preparation of pharmacy students for interprofessional team-based care became a standard to which PharmD programs are held accountable for accreditation by the Accreditation Council for Pharmacy Education (ACPE). Specific language, included in Standard 12, Professional Competencies and Outcome Expectations, describes the ability to function as a member of an interprofessional team to provide pharmaceutical care, manage and use the resources of the health care system, and promote health and disease prevention.<sup>6</sup>

In the outpatient setting, practitioners often face unique barriers for establishing this “team approach to patient care” as office spaces and direct care environments are typically distant from one another. This is especially the case in community pharmacist practice. Community pharmacists often practice in complete professional isolation, with limited face-to-face interaction with physicians, nurses, or even other pharmacists. During the provision of medication therapy management training to community pharmacists in 2004-2005, faculty at the University of Pittsburgh School of Pharmacy became interested in the process for forming professional relationships between community pharmacists and physicians.

In 2006, these faculty and residents initiated a two-part effort named the “Great Partners Project” which aimed to first, better understand the professional interactions that have occurred between community pharmacists and physicians engaged in highly collaborative relationships; and second, design and test methods for teaching relationship development skills to student pharmacists.

Part 1 of the project consisted of a mixed methods (i.e., data collection via both qualitative and quantitative approaches) study of community pharmacist-physician pairs from throughout the United States.<sup>7</sup> Pharmacist and physician pairs were identified by leaders in the pharmacy profession (i.e., pharmacy faculty, pharmacy clinical service managers, and professional association leadership). The

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quantitative portion of the study was the administration of the Pharmacist-Physician Collaborative Index (PPCI)<sup>8-10</sup> to quantify the extent of professional collaboration within the domains of relationship initiation, role specification, and trustworthiness. The qualitative portion consisted of semi-structured interviews with the individual pharmacist and physician participants. The interviews were used to gain additional information about the interactions that occurred between the professionals related to each PPCI domain.

The interviews from Part 1 were used to guide the preliminary efforts of Part 2, that is, the creation of educational modules to teach collaboration skills to student pharmacists. These modules represent an innovative contribution to the University of Pittsburgh School of Pharmacy's curriculum as, prior to these efforts, techniques for developing relationships between community pharmacists and physicians were not formally taught. This paper describes the development of these modules and the evaluation of the modules by a select group of student pharmacists who completed advanced pharmacy practice experiences (APPEs) in community pharmacies.

## **Design of Educational Modules**

### *Influence of Project Part 1 on the Design of the Educational Modules*

Community-based pharmacists and physicians were interviewed for Part 1 (or solely for Part 2 in some cases). Each interview was audio-or video-recorded, most using professional recording services to ensure quality. Interviews captured responses related to how the professionals began to collaborate, issues related to developing trustworthiness, and information about how professional roles were determined.

Actual interview footage is included in Modules 3, 4, and 5 to emphasize the characteristics of highly successful collaborations and to provide examples of how such collaborations are established and maintained. Findings from the interviews with regard to specific communication techniques used by pharmacists were used to guide the development of the rubric used in Module 4.

### *Goal of Designing Educational Modules*

The overall goal of the 5 modules was to enable graduating pharmacists, through the development of the requisite knowledge, skills, and attitudes, to successfully foster collaborative working relationships with community-based physicians. We expected that in the long term this type of experience could facilitate the recognition of pharmacists as members of the health care team in the community and that pharmacists could consistently have an enhanced role to play on this team. Further, we expected that these relationships would positively impact patients and public health through improvements in clinical outcomes and reductions in adverse events and health care spending. In the short term, we anticipated that students participating in this experience would express a greater desire to work collaboratively, would have the skills necessary to do so, and would report greater professional satisfaction as a result of engaging in these collaborations.

### *Module Learning Objectives*

Specific learning objectives are listed in Box 1. These objectives strongly align with the AACP CAPE outcomes.<sup>4</sup> Further, these objectives will assist students in achieving one of the school's practice ability outcomes, which states that "The student should be able to collaborate with health professionals, caregivers, and the patient to formulate a pharmaceutical care plan that maximizes patient response to drug therapy by preventing or resolving drug-related problems in order to achieve a positive outcome."<sup>11</sup> Although pharmacist-physician collaborative working relationships are promoted during the doctor of pharmacy curriculum, formal approaches are not used to develop the knowledge, skills, or attitudes in student pharmacists relevant to establishing relationships with physicians, and students are not assessed on their development. The level of exposure to these relationships also varies across experiences. Therefore, the building of these relationships represents a critical area for improvement in student development.

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### *Content*

The materials were developed as a series of 5 Web-based modules to correspond with each week of the community-based APPEs. Modules 1, 2, and 3 are intended to facilitate student achievement of the first 2 learning objectives from the list above, which include thinking skills at lower levels of the Bloom's Taxonomy.<sup>12</sup> Modules 4 and 5 further challenge students and assist them in achieving the third and fourth objectives. Each module consists of a variety of activities that students complete at their own pace throughout the assigned week. Activities include: readings, worksheets based on "active learning" experiences, forum posts, videos, and reflective writings. Box 1 lists each learning objective and activity by module.

### *Assessment Strategies*

The modules are designed to provide students with both formative and summative evaluations of performance. Formative feedback regarding student performance on activities completed throughout the first 4 modules is to be provided verbally by preceptors (Box 1 details when these feedback sessions are scheduled). Students are instructed to initiate the conversations with preceptors as an opportunity to discuss key learning points and gain the preceptor's perspective on relationship development. In Module 4, preceptors are instructed to assess students on their interactions with physicians or physician representatives with a 7-item communication rubric (see Appendix 1).

The summative assessment for the modules is a final assignment that requires the students to create their own personal "Plan for Developing Collaborative Working Relationships." This assignment is to be completed at the end of Module 5. The student plan was to detail barriers/facilitators that exist at the student's community APPE site for developing relationships and the student's recommendations for next steps. The goal for this assessment was to provide the opportunity for a collegial discussion between the student and the preceptor regarding how physician relationships can be enhanced at the community pharmacy, while enabling students to reflect on what skills he/she will practice further in the future.

### *Format for Delivery*

The Web-based modules were designed by the authors and created by an information technology consultant to the school. The Web site hosting the materials consists of 3 "portals": student, preceptor/faculty and researcher, and are accessible via the input of a username and password. The site was designed so that modules were available to students during pre-defined dates corresponding with the appropriate week of the APPE. Upon accessing each module, the student was presented with a standard format outlining the learning objectives, a brief overview of the module, the amount of time estimated for completion of the module, and links to each assigned activity. A "To Do" list was also provided on the screen to assist the student in successful time management. Finally, links to supplemental resources related to pharmacist-physician collaboration were provided.

A Web-based format enabled the use of specific technologies, such as a discussion board. These technologies were chosen for the materials in order to facilitate student interactions and discussions regarding their learning and minimize the sense of professional isolation that occurs in community pharmacy.<sup>13</sup> The Web-based format was also intended to benefit preceptors as they would be able to learn about their colleagues' practices through discussions with their own students. Finally, this format supported our goal to provide an asynchronous learning environment that promotes individualized development.

Preceptors are able to access materials electronically and are also provided with a hardcopy "Preceptor Manual" to allow participation even if Internet access is not available at a given practice site.

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**Box 1: Learning Objectives and Content Summary for Each Module**

Module	Learning Objective(s)	Content Summary	Formative Assessment Method(s)
1	Discuss reasons for developing collaborative working relationships with physicians	<ul style="list-style-type: none"> <li>• Two assigned readings</li> <li>• On-site activity</li> <li>• Written assignment</li> </ul>	Discussion of written assignment with Preceptor
2	Outline factors that may serve as potential barriers or facilitators to developing collaborative working relationships with physicians	<ul style="list-style-type: none"> <li>• On-site activity</li> <li>• One assigned reading</li> <li>• Written assignment</li> <li>• Two posts to online forum</li> </ul>	Discussion of written assignment with Preceptor  Peer feedback via online forum
3	Identify characteristics of collaborative working relationships	<ul style="list-style-type: none"> <li>• Video to watch</li> <li>• One assigned reading</li> <li>• Written assignment</li> </ul>	Discussion of written assignment with Preceptor
4	Identify characteristics of collaborative working relationships  Practice strategies useful in establishing collaborative working relationships with physicians in the community	<ul style="list-style-type: none"> <li>• Two videos to watch</li> <li>• On-site activity</li> <li>• Post to online forum</li> </ul>	Evaluation by Preceptor during on-site activity
5	Identify characteristics of collaborative working relationships  Practice strategies useful in establishing collaborative working relationships with physicians in the community	<ul style="list-style-type: none"> <li>• Media database assignment</li> <li>• On-site activity</li> <li>• Online post</li> </ul>	Final (graded) project due during this module <sup>a</sup>

<sup>a</sup> Not implemented during preliminary evaluation

### *Preliminary Evaluation of Modules*

The primary objective of the evaluation was to determine student and preceptor satisfaction with the modules and their Web-based format, along with student and preceptor suggestions for improvement. Secondary outcomes were student attitudes towards collaboration and evidence of relevant knowledge and skill attainment. Future evaluations will place greater emphasis on these outcomes. The evaluation of these modules was granted exempt approval status by the University of Pittsburgh Institutional Review Board.

## **Methods**

### *Study Setting*

This study was conducted with a sample of 6 student pharmacists from the University of Pittsburgh completing APPEs in community pharmacies. The specific pharmacy sites from which students participated included community-based practice settings in which students were likely to practice in the future: chain pharmacy (3 locations included), independent pharmacy (1 location), and institutional outpatient pharmacy (1 location).

### *Selection of Study Sample*

The curriculum at the University of Pittsburgh School of Pharmacy currently consists of 3 academic years of traditional classroom work complemented by introductory pharmacy practice experiences (IPPEs) followed by a fourth professional year consisting of one 6-week and six 5-week advanced pharmacy practice experiences (APPEs). The IPPEs include service learning and community health in the first year, community pharmacy practice in the second year, and institutional practice in the third year. Collectively, the IPPEs and APPEs represent a minimum of 1740 hours of practice experience in a variety of pharmacy settings. Students are required to complete 1 APPE each of institutional, community, acute, and ambulatory pharmacy practice, along with an additional experience in either the acute or ambulatory setting. In addition, students must complete 2 elective experiences.

Currently, the only consistent and deliberate exposure to the development of pharmacist-physician relationships occurs in the second professional year IPPE. This reflects the school's focus on the development of pharmacists as patient care providers in the community. In this part of the curriculum, students explore pharmacist-physician relationships in the community through the completion of one assignment at their IPPE community site. This assignment requires them to reflect on the physicians in the community with whom they would be interested in collaborating, the specific qualities that appeal to them in their potential collaborators, and the methods they may be able to use to approach physicians to initiate a relationship.

The authors elected to evaluate these modules by students completing APPEs in the community for several reasons. There was a significant need in the fourth year of the professional curriculum to formally revisit professional relationship development in order to expand on the brief exposure in the second year. These new educational modules naturally build on the foundation that the current fourth-year students established during their second year IPPE, and complement the additional practice experience and autonomy of students at a later stage of formal education.

## **Data Collection**

### *Student/Preceptor Satisfaction and Suggestions for Improvement*

Student satisfaction data were collected both through "activity rating" features included for each component (e.g., readings, on-site activities, etc.) of the modules and through course evaluations. The activity rating feature provided students with the opportunity to rate each individual component of the

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modules; however, completion of ratings was not required for the student to progress to the subsequent module. In other words, students could elect to only rate a portion of the activities they completed.

Course evaluations were administered electronically to students and faculty/preceptors at the conclusion of the 5-module sequence. Students completed two evaluations. The first was a 7-item Likert-type questionnaire with a small comments/suggestions field (see Appendix 2). These questions were adapted from standard course evaluations administered throughout the University of Pittsburgh. The second evaluation consisted of 5 open-ended questions (see Appendix 3). This questionnaire was administered to gather additional comments regarding the aspects of the modules that students and faculty/preceptors liked or disliked and their suggestions for improvement. One reason for choosing to gather additional qualitative comments was that the small sample size of respondents (students) limited the authors' ability to gather meaningful quantitative data from the questionnaires. Preceptors completed one evaluation consisting of 6 closed-ended questions and a small open comments/suggestions field (see Appendix 4).

#### *Student Attitudes Toward Collaboration*

Students completed a 14-item survey (in the form of a Likert-type scale) prior to Module 1 and immediately following Module 5. This questionnaire collected information about their perceptions regarding the importance of collaboration with physicians, self-efficacy regarding collaboration, and roles of pharmacists and physicians. This survey was modified from the Interdisciplinary Education Perception Scale (IEPS) and the Readiness of Healthcare Students for Interprofessional Learning Scale (RIPLS).<sup>14-15</sup> (See Appendix 5 for a copy of the survey.)

#### *Evidence of Knowledge and Skill Attainment*

While the original intent was to collect knowledge and skill attainment data through uploading written assignments and student grades to the Web site, these data were not collected due to technology issues (e.g., system prompts for frequent password resets, etc.) that prevented students from consistently completing and uploading all assignments. Subjective data regarding knowledge and skill attainment are collected via the item on the student and preceptor evaluations that asked respondents to indicate their agreement with, "These materials have improved my/my students' ability to work collaboratively with physicians."

### **Data Analysis**

#### *Student/Preceptor Satisfaction*

The Web site was programmed by the information technology consultant to automatically calculate descriptive statistics (number of respondents, medians, means, and frequencies of each response) for student responses using the activity rating feature. For Student Evaluation 1 and the preceptor evaluation, the Web site was programmed to calculate mean responses (from the Likert-type scale) and total number of responses for each item. All of these data were then made available for review by the authors via the "researcher portal."

#### *Student Attitudes Toward Collaboration*

The Web site was also programmed to calculate the number of responses and mean responses (from the Likert-type scale) on the 14-item questionnaire, before the respondents completed Module 1 and then after respondents completed Module 5.

#### *Student/Preceptor Suggestions for Improvement*

The authors reviewed each comments field along with the open-ended responses to the items in Student Evaluation 2 in order to determine commonalities. Findings were summarized and representative quotations are provided.

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## Results

### *Student Satisfaction*

A summary of student ratings of the modules are included in Table 1. Overall, students considered Modules 3 and 4 (which included videos of pharmacists and physicians discussing their experiences with collaboration) to be the most helpful. In fact, the only individual activity with a median rating of 5 (the highest possible) was the approximately 40-minute video included as part of Module 3. This video featured 3 practitioner “pairs” and described how the professionals initiated their collaborations, the challenges they faced, and their advice for others. A detailed description of Module 3 is included in Box 2. Other activities that were rated highly (median rating of 4.5) by students included the Module 2 on-site activity and assigned reading, and the Module 4 video and audio clips and on-site activity. The lowest scoring activities (median ratings of 2 and 3) were those included in Module 1, which were designed to present students with reasons for initiating collaborative working relationships with physicians.

**Table 1:** Student Ratings of Module Activities in Response to the Statement, “This activity has contributed to my learning on how to collaborate with physicians.”

Module	Specific Activity	Number of Rates <sup>a</sup>	Median Rating <sup>b</sup>
1	Assigned Readings	4	3
	On-site Activity/Written Assignment	3	2
<b>Module 1 Overall Rating</b>		7	3
2	On-site Activity	2	4.5
	Assigned Reading	4	4.5
	Written Assignment	3	4
<b>Module 2 Overall Rating</b>		9	4
3	Video	4	5
	Assigned Reading	3	4
	Written Assignment	2	4
<b>Module 3 Overall Rating</b>		9	5
4	Videos	4	4.5
	On-site Activity	2	4.5
	Written Assignment	2	4
<b>Module 4 Overall Rating</b>		8	4.5
5	Videos	2	4
	On-site Activity	2	3.5
	Written Assignment	2	4
<b>Module 5 Overall Rating</b>		6	4

<sup>a</sup> Students were not required to rate every activity; therefore the N provided for each individual activity may be less than the total number of participating students (6).

<sup>b</sup> 1= Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Strongly Agree

The student responses to the quantitative items on Evaluation 1 are summarized in Table 2. The comments from the student evaluations 1 and 2 provided further detail and revealed similar findings to what was demonstrated by the activity ratings. For example, their comments further explained the high rating given to the Module 3 video. One student stated, “I believe the videos had the greatest impact on my learning because they showed real relationships between pharmacists and physicians and commonalities between successful relationships.” Another student echoed this, “I thought it was most helpful to hear the insights of pharmacists and physicians who are working in collaborative practice relationships.”

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Vol 6, Issue 1, Spring 2010

Although students were generally satisfied with the content of the educational modules, they reported dissatisfaction (through their comments) with the technology issues they encountered while participating in the pilot in spite of providing a quantitative mean rating of 3.8 for the combination of Web and practice activities. One student stated, "I think being frustrated with the Web site...may have impacted my learning experience. However, I do think that the learning materials are important to the course...." Another student commented that, "Only the technical issues need to be improved. The content was great, especially the videos...."

**Box 2:** Detailed Description of Module 3

Activity	Description	Estimated Time for Completion
Video	<p>Three pairs of pharmacists and physicians describe how their relationships were initiated, barriers they overcame, and their advice for students.</p> <p>When watching the video, students were asked to consider the following questions:</p> <ol style="list-style-type: none"> <li>1. How were these relationships initiated?</li> <li>2. What seemed to work well in the process of developing these relationships? What challenges did the practitioners face? How did they overcome these challenges?</li> <li>3. Which stage of the model for developing collaborative working relationships do you think each of these practitioner pairs are in? What did you observe that led you to make those decisions? How were these stages of the model achieved? If you placed the three pairs at different stages, what was unique about each pair?</li> </ol>	40 minutes
Readings	<p>Required:</p> <ol style="list-style-type: none"> <li>1. Brock KA, Doucette WR. Collaborative working relationships between pharmacists and physicians: an exploratory study. <i>J Am Pharm Assoc.</i> 2004;44:358-365.</li> </ol> <p>Recommended:</p> <ol style="list-style-type: none"> <li>1. Doucette WR, Nevins J, McDonough RP. Factors affecting collaborative care between pharmacists and physicians. <i>Res Social Adn Pharm.</i> 2005;1: 565-578.</li> </ol> <p>Readings provide additional information about characteristics of collaborative working relationships.</p>	1 hour
Reflective Writing	<p>Students were to write a 2-3 page reflection (double-spaced, 12 point font) that answers the attached questions:</p> <ol style="list-style-type: none"> <li>1. Compare and contrast the stages of the collaborative working relationship that you have observed at your practice site with those in the video. What relationship characteristics exist across practitioner pairs? What is unique about the different relationships?</li> <li>2. What characteristics might help existing working relationships become collaborative working relationships?</li> <li>3. Have you experienced or observed challenges to developing collaborative working relationships that were similar to those described in the video? How are the challenges different at your practice site different? What do you think is at the "root" of these challenges?</li> </ol>	1 hour
Total		2.5 hours

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*Education and Practice*

Vol 6, Issue 1, Spring 2010

**Table 2:** Student Responses to Evaluation 1

Evaluation Item	Mean Response (N=5) <sup>a</sup>
1. Rate the amount YOU contributed to your learning.	2.2 <sup>b</sup>
2. These materials have improved my ability to work collaboratively with physicians	3.6 <sup>c</sup>
3. These materials met the stated objectives	4
4. Content was presented clearly and in a logical manner	3.6
5. I had adequate time to complete course assignments	4
6. The combination of Web-based and practice activities contributed to my learning	3.8

<sup>a</sup> Only 5 of 6 students provided responses.

<sup>b</sup> Indicated response on Likert-type scale: 1=much less than in most courses I have taken, 2= somewhat less than in most courses I have taken, 3= about the same as in most courses I have taken, 4= somewhat more than in most courses I have taken, 5= much more than in most courses I have taken

<sup>c</sup> For items 2-6, the following response scale was used: 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree.

### *Preceptor Satisfaction*

One preceptor completed the evaluation of the educational materials and their responses to the quantitative evaluation items are included in Table 3. This preceptor indicated agreement with each statement of the evaluation except for, "I had adequate time to discuss course assignments with students." For this item, the preceptor indicated that he/she disagreed.

**Table 3:** Results of Preceptor Evaluation

Evaluation Item	Mean Response (N=1) <sup>a,b</sup>
These materials have improved my students' ability to work collaboratively with physicians	4
These materials met the stated objectives	4
Content was presented clearly and in a logical manner	4
I had adequate time to discuss course assignments with students	2
The combination of Web-based and practice activities contributed to my ability to teach effectively	4
The combination of Web-based and practice activities contributed to students' learning	4

<sup>a</sup> Only 1 of 5 preceptors provided responses.

<sup>b</sup> 1=strongly disagree, 2= disagree, 3= neutral, 4= agree, 5= strongly agree

### ***Suggestions for Improvement***

Students gave several suggestions for how the educational modules could be improved. By far, the most common complaint was regarding the technology issues they encountered (e.g., system prompts for password changes, previously entered data not being saved, etc.). Another common request was for

assigned readings to be included as PDF files or be limited to those readily available on the Web. Students also expressed a desire for direct interaction with a physician in their community. While this sentiment was the goal of Module 4, it appears as though few students in the pilot, if any, had the opportunity to speak directly with a physician. One student also suggested that the concepts taught in the modules should be introduced much earlier in the professional curriculum, i.e., during the first professional year.

The fifth module also provided information regarding the interests and educational needs of the students. In this module, students were to search the media library for videos and audio clips that highlighted topics related to collaboration that interested them. They searched for the following topics, beginning with the most popular: education (9 searches), climate (7 searches), collaboration, expectations, support (all searched twice), building relationships, difficulties, problems, and residency (each searched once).

The preceptor respondent suggested that in the future, a face-to-face introductory session to describe the use of the Web site could be held for students at the start of the APPE, with a similar session for preceptors held by webinar.

#### *Attainment of Relevant Attitudes*

As a secondary outcome measure of this preliminary evaluation of the modules, we collected pre- and post-modules data from students regarding their attitudes toward working with physicians (see Table 4). Due to the very small sample size, these data were not evaluated with statistical analyses. Further assessments with a larger number of students are needed to determine the impact of these materials on student attitudes. In this pilot study, students with positive attitudes towards these professional

**Table 4:** Student Attitudes Towards Collaboration Pre- and Post-Module Completion

Item	Mean Response <sup>a</sup>	
	Pre- Modules (n=3)	Post-Modules (n=4)
Patients would ultimately benefit if pharmacists and physicians worked together to solve patient problems	5.0	5.0
I am confident that I will be able to develop effective relationships with physicians	4.7	4.2
Team-working skills are essential for pharmacy students to learn	4.7	4.8
It is not necessary for pharmacy and medical students to learn together	1.3	1.8
The function of pharmacists is mainly to provide support for physicians	3.0	2.8
Pharmacists are able to work closely with physicians	4.3	3.8
Pharmacists need to cooperate with physicians	4.3	4.5
Pharmacists have good relationships with physicians	4.3	3.0
Physicians respect the work done by pharmacists	2.7	3.5
Physicians think highly of pharmacists	3.0	3.5
Pharmacists think highly of physicians	4.0	4.0
Physicians often seek advice of pharmacists	3.7	3.0
I am not sure what my professional role will be	2.0	2.8
I have to acquire much more knowledge and skills than medical students	2.0	2.0

<sup>a</sup>1=strongly disagree, 2= disagree, 3= neutral, 4= agree, 5= strongly agree

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relationships may have self-selected as the participating students elected to complete ambulatory care APPEs at community sites (rather than traditional ambulatory care clinics) known to be providing direct patient care in addition to dispensing services.

#### *Attainment of Relevant Knowledge and Skills*

While student and preceptor responses on the evaluations (see Tables 2 and 3) suggest a perceived positive impact of the modules on student learning, actual evidence (e.g., assignment scores, etc.) of knowledge/skill attainment were not formally collected. Due to the technology issues described above, students and preceptors reported difficulty completing activities (particularly the final project) thus, potential student performance is unknown. Further evaluation is needed in order to draw conclusions about the impact of these modules on student learning.

#### **Discussion**

The results of this pilot study demonstrate that bringing pharmacists and physicians engaged in successful collaborations into a virtual “classroom” through the use of multimedia may be a viable approach to teaching student pharmacists important concepts related to pharmacist-physician communication and relationship development. The experiences and advice shared by the “model collaborators” can complement the relationship role modeling provided by the students’ preceptors and may add unique perspectives as highly collaborative relationships between community pharmacists and physicians are not yet the norm. Bringing content experts from across the United States to students virtually has been used successfully by the University of Pittsburgh School of Pharmacy in the past. In 2006, the School led the development of DM Educate, a comprehensive online course that teaches students to effectively manage diabetes.<sup>16</sup> The model of DM Educate enables on-site educators to benefit from the expertise of those providing the taped lectures. In the current pilot study, the recordings enabled students to hear the perspectives of not only pharmacist practitioners, but also that of their physician colleagues, and provided opportunities for targeted discussions between the students and preceptors.

The results of the pilot demonstrate that students perceived the audio and video recordings featuring the experiences of these professionals as key to their learning. However, additional work is needed to know if students exposed to these modules are able to more effectively develop collaborations with physicians. Further, while the educational modules provide the perspectives of both practitioners, the materials were focused on enabling student pharmacists to develop these relationships. This approach was taken as pharmacists are often the relationship initiators<sup>7,17</sup> and there was an identified need in the School of Pharmacy for additional education in this topic area. Further work is necessary to determine how the modules (and specifically the recordings) could be used with a student physician audience or in an interprofessional education experience.

The overarching goal of this pilot study is not unique to this project and efforts by other authors to promote student pharmacists’ attitudes and skills regarding interprofessional collaboration have been described.<sup>25-27</sup> However, many of the teaching and learning methods used in these examples differ from those described in this pilot, with these previous efforts primarily focused on providing face-to-face interactions between students of the different health professions. While these experiences are clearly very valuable, the emphasis is often not on the unique nature of community pharmacist-physician relationships. Further, the important role played by pharmacist preceptors in developing student pharmacist skills in relationship development and communication with physicians specifically was emphasized by McDonough and Bennett in an article for APPE preceptors.<sup>28</sup> In that article, they describe a conceptual model and key literature<sup>3,9</sup> on pharmacist-physician relationships while providing preceptors with teaching tips. However, a formal coursework plan is not presented. The current pilot series of modules builds on their suggestions by providing educators with a formal strategy for introducing this literature and teaching these concepts during APPEs.

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## Limitations

There are clear limitations that must be considered when interpreting the results of the preliminary evaluation of the educational modules. First, the very small sample size of participating students prevented the authors from gathering adequate quantitative data to draw conclusions from responses to the course evaluations and the attitudes assessment. Further, we may have selected students that already had a positive attitude towards collaboration so it is unknown how students outside of this group or from other schools might perceive the modules. For example, while students reported satisfaction with most of the modules used in this pilot study, the first module was not perceived as being especially contributory to their learning. This module emphasized the importance of developing pharmacist-physician collaborative working relationships, however this learning point may have been unnecessary in this group of students. These student pharmacists elected to complete the APPE at innovative community sites, known to be engaged in direct patient care activities that commonly require collaboration with physicians.

Our findings also emphasize a need for improved preceptor orientation to the overall course design, learning objectives and implementation strategies of the teaching resources prior to expanding this pilot to additional experiential sites. Although the students and the preceptor respondent indicated that the combination of Web and practice-based activities was useful, the preceptor indicated that there was not sufficient time to discuss assignments with the students. The numerous responsibilities faced by preceptors and inadequate dedicated time for the pilot study may have impacted the preceptor evaluation completion rate. Eliciting preceptor feedback during an orientation process may have enhanced their experiences with the pilot and improved the preceptor evaluation completion rate. Future efforts should include a greater focus on meeting preceptor needs during the implementation of the modules. Finally, the authors were unable to collect formal data on student knowledge and skill attainment due to numerous technology issues that limited the ability of students to complete and upload all assignments.

## Conclusions

Our findings suggest that continued development of multimedia featuring examples of practicing professionals is warranted. However, due to the small number of student users included in this study, further work is needed to know the impact of these modules on student learning and skill development. It is also important to consider the potential impact of technology limitations on perceived student learning. During this pilot study, students made many suggestions for improvement, and these are being used in the refinement of the modules and plans for future evaluations. Further, we have asked additional community-based practitioners, educators, and researchers to review the content and suggest revisions. The authors are also considering other applications for the materials. Per the suggestion of one respondent, a subset of the materials was recently introduced during the first professional year at the University of Pittsburgh School of Pharmacy. Some of the materials have also been incorporated into a program that will provide training in medication therapy management to preceptors throughout Pennsylvania. Faculty and others interested in using the materials may contact the first author.

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### Appendix 1

#### Rubric for the Assessment of Student Pharmacist- Physician Exchange<sup>a</sup>

Communication Behavior	Competency Level	Comments
	NI: Needs Improvement S: Satisfactory Ach: Achieved	
Selected communication method appropriate for clinical situation	<input type="checkbox"/> NI <input type="checkbox"/> S <input type="checkbox"/> Ach	
Student introduces self and explains their role	<input type="checkbox"/> NI <input type="checkbox"/> S <input type="checkbox"/> Ach	
Student maintains patient-centered (rather than product-centered) focus to interaction	<input type="checkbox"/> NI <input type="checkbox"/> S <input type="checkbox"/> Ach	
Student provides adequate patient-specific background information	<input type="checkbox"/> NI <input type="checkbox"/> S <input type="checkbox"/> Ach	
Student provides specific recommendations or solutions to identified medication therapy problem	<input type="checkbox"/> NI <input type="checkbox"/> S <input type="checkbox"/> Ach	
Steps for resolution are discussed and clear (i.e. student to follow up with patient, physician to call pharmacist back, nurse to relay information, etc.)	<input type="checkbox"/> NI <input type="checkbox"/> S <input type="checkbox"/> Ach	
Entire communication process is concise but complete	<input type="checkbox"/> NI <input type="checkbox"/> S <input type="checkbox"/> Ach	

<sup>a</sup> Partially based on results of Part 1 of Great Partners Project

### Appendix 2

#### Student Evaluation1

#### Collaboration Course Enhancement Materials Student Evaluation of Course

**For items 1 and 2, mark the number of the category that best describes your judgment. Think only about the collaboration section of the course when responding.**

1. Much less than in most courses I have taken.
2. Somewhat less than in most courses I have taken.
3. About the same as in most courses I have taken.
4. Somewhat more than in most courses I have taken.
5. Much more than in most courses I have taken.

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1. Amount that YOU contributed to your learning. 1 2 3 4 5
2. Amount that you learned. 1 2 3 4 5

**For items 3-8, please indicate your response to the following items by choosing the category that best describes your judgment. Judge each item separately.**

1. Strongly Disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly Agree

3. These materials have improved my ability to work collaboratively with physicians.	1	2	3	4	5
4. These materials met the stated objectives.	1	2	3	4	5
5. Content was presented clearly and in a logical manner.	1	2	3	4	5
6. I had adequate time to complete course assignments.	1	2	3	4	5
7. The combination of web-based and practice activities contributed to my learning.	1	2	3	4	5

Comments/Suggestions for Improvement:

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### Appendix 3 Student Evaluation 2

#### Collaboration Course Enhancement Materials Student Evaluation of Course

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**\*\*Think only about the collaboration section of the course when responding.\*\***

1. The aspect of these materials that was the most helpful for my learning is ...
2. The part of the physician collaboration section that I enjoyed the most was...
3. The part of the physician collaboration section that I liked the least was...(please explain)
4. The most challenging part of the physician collaboration section was ...
5. The one thing I expected out of the physician collaboration section that was not provided is ...

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Education and Practice*

Vol 6, Issue 1, Spring 2010

**Appendix 4  
Preceptor Evaluation**

**Collaboration Course Enhancement Materials  
Faculty/Preceptor Evaluation of Course**

**For items 1-6, Please indicate your response to the following items by choosing the category that best describes your judgment. Judge each item separately.**

- 1.Strongly Disagree
- 2.Disagree
- 3.Neutral
- 4.Agree
- 5.Strongly Agree

1. These materials have improved my students' ability to work collaboratively with physicians.	1	2	3	4	5
2. These materials met the stated objectives.	1	2	3	4	5
3. Content was presented clearly and in a logical manner.	1	2	3	4	5
4. I had adequate time to discuss course assignments with students.	1	2	3	4	5
5. The combination of web-based and practice activities contributed to my ability to teach effectively.	1	2	3	4	5
6. The combination of web-based and practice activities contributed to students' learning.	1	2	3	4	5

Comments/Suggestions for Improvement:

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**Appendix 5**  
**Student Perceptions Survey**

**Pre and Post Survey (Weeks 1 and 5) to measure student attitudes towards collaborating with physicians and perceptions of professional roles\***

1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree

	SD	D	N	A	SA
1. Patients would ultimately benefit if pharmacists and physicians worked together to solve patient problems.	1	2	3	4	5
2. I am confident that I will be able to develop effective relationships with physicians.	1	2	3	4	5
3. Team-working skills are essential for pharmacy students to learn.	1	2	3	4	5
4. It is not necessary for pharmacy and medical students to learn together.	1	2	3	4	5
5. The function of pharmacists is mainly to provide support for physicians.	1	2	3	4	5
6. Pharmacists are able to work closely with physicians.	1	2	3	4	5
7. Pharmacists need to cooperate with physicians.	1	2	3	4	5
8. Pharmacists have good relationships with physicians.	1	2	3	4	5
9. Physicians respect the work done by pharmacists.	1	2	3	4	5
10. Physicians think highly of pharmacists.	1	2	3	4	5
11. Pharmacists think highly of physicians.	1	2	3	4	5
12. Physicians often seek advice of pharmacists.	1	2	3	4	5
13. I am not sure what my professional role will be.	1	2	3	4	5
14. I have to acquire much more knowledge and skills than medical students.	1	2	3	4	5

\* Modified from the Interdisciplinary Education Perception Scale and the Readiness of Healthcare Students for Interprofessional Learning Scale (RIPLS)