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Abstract

Objectives. To implement and assess a first-year pharmacy student group research project that provided practical hands-on application and reinforced the curricula of concurrent didactic courses.

Design. Groups of 6 to 7 students chose a public health topic based on the Healthy People 2010 Priority Areas and created a survey instrument. Faculty facilitated mock institutional review board (IRB) review sessions which provided teams with ongoing feedback and refinement recommendations before each team administered their survey instrument to a predefined population. Data analysis, formal written reports, and oral presentations were presented to peers and project faculty members.

Assessment. Teams complied with the requirements of the mock IRB, effectively applied basic research principles learned in class, collected survey data, performed inferential statistical analyses on the data, and presented their project findings. Two-hundred six of 210 students (98%) reported feeling satisfied with both the results of their project and the accomplishments of their team.

Conclusions. Teams applied a varied skill set including primary literature evaluation, basic research principles, statistics, public speaking, and peer collaboration in conducting a public health research project. First-year pharmacy students may benefit from participation in a collaborative research project that provides hands-on application of material being taught in didactic courses.

Disciplines

Pharmacy and Pharmaceutical Sciences

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INSTRUCTIONAL DESIGN AND ASSESSMENT

A Team Public Health Research Project for First-Year Pharmacy Students to Apply Content From Didactic Courses

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Conclusions. Teams applied a varied skill set including primary literature evaluation, basic research principles, statistics, public speaking, and peer collaboration in conducting a public health research project. First-year pharmacy students may benefit from participation in a collaborative research project that provides hands-on application of material being taught in didactic courses.

Keywords: curriculum, public health, research

INTRODUCTION

Traditional pharmacy curricula expose students to concepts and skills such as: drug information, study design, communication, professionalism, public health, and health literacy. Concepts are commonly delivered in didactic lectures and students often are not given the opportunity to practice skills and apply knowledge within the course. At the University of the Pacific, we wanted to preserve the traditional content of pharmacy courses while implementing a longitudinal, semester-long, team research project to give students the opportunity to apply skills. Our goals were to allow students to: apply the foundational ideas of drug information and study design; gain insight into team-building skills; and interact with the community as public health educators. Through this activity, we also met specific ACPE standards and CAPE outcomes, which charge schools to demonstrate their students' application of the various skills taught in the pharmacy curriculum.[1,2] Some of the targeted standards and outcomes focused on: learning about the expanding role of the pharmacist as an interprofessional collaborator and public health educator; providing educational services using processes considering patient safety and legal health-related policies; and identifying public health areas to which they could apply their growing repertoire of didactic pharmacy school concepts.

Examples of other capstone projects implemented in various courses throughout the pharmacy curriculum include use of elaborate patient cases featuring multiple disorders, various interacting medications, and a host of drug-related problems.[3,4] All of these relied heavily on the students having successfully completed prior therapeutics modules and most were not offered until the end of the students' didactic education. Other projects involved healthcare system scenarios challenging students to work on formulary decision-making, mock pharmacy and therapeutics committee issues, or public health-related presentations. Some of these projects, however, did not allow students to interact and share their knowledge with the public. The literature is scant on the practices of integrating

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early non-foundational science content and skill sets in the first semester of pharmacy school. Further, few schools have incorporated the research concepts and instruction of institutional review boards (IRBs) into the curriculum.[3,4]

We hoped that adding this project to the first didactic semester of the curriculum would help convey the value of concepts typically less appealing to students since they traditionally focus less on drug therapy, disease management, or pharmacology. We thought early integration of a longitudinal capstone project might help students acclimate to the demands of the pharmacy program, stimulate socialization through peer-communication and collaboration, and demonstrate pharmacists' roles as public health educators and researchers.[5-11] Finally, we felt this project would allow students to begin thinking about integration and searching for methods to apply the concepts they learn in the classroom from the beginning of pharmacy school. We describe the process of adding this project to our curriculum, provide examples of resources used in implementing the project, and present the results of a student survey to assess the project. We also describe the collaborative nature of the project, which involved 2 faculty members who were simultaneously teaching separate courses within the same first-year curriculum.

DESIGN

Study tools and resource links to helpful Web sites were communicated to students using Blackboard Learning technology. Class time was used to deliver lectures using word documents and PowerPoint presentations. Didactic lessons were supplemented with discussions, during which faculty members took time to provide guidance, clarify points of confusion, and deliver additional information on the application of classroom material to their ongoing projects.

At the start of the semester, students were given access to Healthy People 2010 initiatives and a schedule with a series of lectures on patient communication, professionalism, health literacy, research, and the IRB processes within the Pharmacy Systems I course (Table 1). Drug information applications and study design instruction started during week 8 of the first semester, supplying students with didactic lessons on study design and data analysis. The entire schedule for the first semester in pharmacy school was presented to students in week 1.

The grading process for the project (pass/no-pass overall) and expectations for longitudinal deadlines throughout the semester were communicated to students on the first day of class. Students (n = 210) were divided into 33 teams of 6-7 students during week 2. Research discussions were held in week 3 and students were allowed to work with the Healthy People 2010 initiatives and begin researching background literature on topics of interest (Tables 2 and 3). Topics chosen by groups were first submitted to the 2 project faculty members who approved all topics, ensured minimal topic duplication among groups, and took on the role of "mock IRB."

Once topics were approved, students created survey instruments to test their hypotheses. Completed survey instruments were submitted to the faculty members to ensure the instruments met the criteria for professional and health literate communication before being shared with the public. The faculty members reviewed the survey instruments for grammatical errors, excessive medical jargon, and leading question structures. Reviewers often challenged students on why they had to ask certain items and gave specific guidance to students regarding the utility of the information obtained from item responses. Students were commonly asked to reduce medical jargon, decrease the number of survey items, modify question format and ranges (ie, age ranges), and reevaluate questions to best meet project objectives. Students were not penalized for having to make changes to their survey instruments, but understood the process of data collection could not occur until the instrument was approved. In their final submissions, students were instructed to submit supplemental IRB write-ups similar to those used in clinical practice facilities for the approval of human research. Students were provided with a general template which prompted them to consider major ethical concerns of human research, discuss confidentiality issues, and address concerns for special populations, subjects' rights, and overall general safety. Concerns regarding the risks and benefits of carrying out their inquiries were also addressed, ie, encountering dangers, violence, and exposure to disease in the process of administering the survey instruments to the public.

The project faculty members granted final approval of survey instruments based on the appropriateness of the questions as they related to the groups' hypothesis, and based on topic originality. Some surveys targeting populations other than the student body required students to ask permission from local business owners/managers to be on the premises, approach customers, and ask them to participate in the survey. After receiving final approval from the faculty members and, if needed, local business owners/managers, students began conducting their surveys. By the time students' surveys were approved, they began receiving concurrent instruction in study design and statistical data analysis throughout the last 8 weeks of the semester. The groups used this new knowledge to decide on/select the most appropriate study design and methods to collect and analyze their data.

Table 1. Pharmacy Systems I General Course Schedule

Course Week	Topics Covered	Project Progression
Week 1	• Introduction • Historic Overview • Professional Issues (Discussion: E-portfolio, CV, Resume)	Introduction to Project and Schedule
Week 2	• Pharmacy's Place in Health Care • Pharmacy Technology and Automation • Careers • Research Intro • Medical Vocabulary Quiz (Discussion: Career Pathways)	Lecture on IRB, research and ethics (pertaining to research)
Week 3	• Cultural Competency and Health Literacy • Medical Vocabulary Quiz • Discussion: Research Project and Dispensing lab 1	Teams assigned and students work in groups to brainstorm topic ideas using Health People 2010 Initiatives
Week 4	• Communication Theory • Counseling • Medical Vocabulary Quiz • Discussion: Cultural Competency and Health Literacy and Dispensing Lab 2	Topics are selected and approved by faculty. Students begin work on surveys after exposure lectures on cultural competency and health literacy.
Week 5	• Compliance • Medical Vocabulary Quiz • Discussion: Research Project	Students continue working on projects: finishing and submitting surveys for faculty approval.
Week 6	• Drug Use Process, • Pharmaceutical Care • Community Pharmacy • Discussion: No Discussion (Fall Holiday)	Students get surveys reviewed and approved in order to start data collection and analysis after midterm week.
Week 7	• Midterm Week	Start of Pharmacy Biostatistics Students begin interviewing the public and gathering data.
Week 8	• Blood Pressure • Smoking Cessation • Weekly Quiz - Top 200 Drugs • Discussion: Blood Pressure	
Week 9	• Smoking Cessation Program • Weekly Quiz - Top 200 Drugs • Discussion: Blood Pressure and Dispensing Lab 3	Modifications to surveys can be made as long as faculty members are notified and new write-ups are submitted.
Week 10	• Pharmacy Showcase Monday, October 29	Students continue working on projects as they learn about statistical analysis and study design.

(Continued)

Table 1. (Continued)

Course Week	Topics Covered	Project Progression
	• Professional Settings (Hospital, Managed Care, Home Health and Long Term Care)	
	• Weekly Quiz - Top 200 Drugs	
	• Discussion: Smoking Cessation	
	• Dispensing Lab 4	
Week 11	• Pulmonary Patient Education	
	• Weekly Quiz - Top 200 Drugs	
	• Discussion: Smoking Cessation	
	• Dispensing Lab 5	
Week 12	• Quality Programs	
	• Weekly Quiz- Top 200 Drugs	
	• Discussion: Pulmonary Patient Education	
	• Dispensing Lab 6	
Week 13	• Practicum (Monday) 11:00 to 3:00 by appointment	Final written projects are submitted and students were instructed to complete self, peer, and research-related evaluation surveys.
	• Quality Programs	
	• Weekly Quiz- Top 200 Drugs	
Week 14	• Drug Approval • Pharmaceutical Industry	Presentation of Final project
	• Government	
	• Academia	
	• Discussion: Oral Presentation of Research Projects	
Week 15	• Final Exams	

After completing their surveys, each group had to prepare a presentation and a paper containing the major components found in common pharmacy journals (eg, abstract, introduction, and conclusion). At the end of the semester, the groups presented their project findings to their peers and project faculty members. Individual grades were based on completion of all assignments.

EVALUATION AND ASSESSMENT

All students completed the assigned tasks and met all deadlines. Faculty members received 33 reports, watched all teams presentations at the end of the semester, and reviewed all finished papers. Each component of the project was graded based on completion (pass or no/pass). Students were informed that a 5% penalty of the total

Table 2. Pharmacy-oriented Objectives in Health People 2010

1. Reduce by 50% medication admissions to short stay acute hospitals due to drug therapy management problems.
2. Increase to 75% the proportion of Medicare enrollees with diabetes receiving appropriate education and preventative services.
3. Increase to 25% the proportion of pharmacies providing administration of influenza and pneumococcal immunizations to adults.
4. Decrease the number of pharmacies who sell tobacco and tobacco-related products to no more than 20% and increase the number of pharmacists who provide tobacco cessation counseling, support and referrals to smokers to 90%.
5. Substance abuse: add prescription medication to alcohol and other drugs that contribute to substance abuse.
6. Increase the number of pharmacies that offer patient counseling on diabetes and other chronic diseases.
7. Reduce by 50% the courses of antibiotics prescribed for the common cold per population.
8. Increase the number of medical, nursing, public health, pharmacy, dentistry, and allied health academic training programs that include a unit on the prevention and control of emerging, re-emerging, and drug-resistant infectious diseases.

Table 3. Health People 2010 Priority Areas

1. Physical activity and fitness	12. Food and Drug Safety
2. Nutrition	13. Oral Health
3. Tobacco	14. Maternal and Infant Health
4. Substance Abuse: Alcohol and Other Drugs	15. Heart Disease and Stroke
5. Family Planning	16. Cancer
6. Mental Health and Mental Disorders	17. Diabetes and Chronic Disabling Conditions
7. Violent and Abusive Behavior	18. HIV Infection
8. Educational- and Community-Based Programs	19. Sexually-transmitted Diseases
9. Unintentional Injuries	20. Immunization and Infectious Diseases
10. Occupational Safety and Health	21. Clinical Preventative Services
11. Environmental Health	22. Surveillance and Data Systems

course grade would be given for each missed deadline, and this apparently created enough incentive for students to keep abreast of all deadlines as faculty members encountered no missed deadlines or evidence of inadequate student effort for all work submitted.

With regard to the students' final topic selection, some groups chose to investigate similar topics (ie, substance abuse and healthy eating habits) but their research took a different approach or was based on a different hypothesis. Many groups focused on preventative health care topics and common health concerns, targeting populations in various community venues. A majority of the students' surveys focused on capturing descriptive data and the public's perceptions of certain health-related topics and providing education on preventative care (Table 4). Every group incorporated questions into their survey instrument on respondent ethnicity, education level, and/or age, perhaps recognizing the value of these descriptors in better understanding their target populations' responses to health-related questions. Regarding submissions, 84% of groups needed to revise their first drafts due to excessive jargon. Groups recognized how difficult communicating with the public can be and were challenged to apply the concepts of health literacy to their surveys and IRB write-ups prior to resubmitting.

At the end of the semester, students also were asked to provide subjective feedback about group performance using self- and peer-evaluation forms (Table 5). All survey instruments were confidential and collected by the faculty members. Regarding comfort levels with the project, 55% of all students felt "extremely comfortable" with self-directed work, while the rest felt comfortable to various degrees. None of the students reported discomfort with self-directed learning (Figure 1). Most students reported various degrees of satisfaction with collaboration, while a small number of students ($< 1\%$) reported no satisfaction with the team aspect of the project (Table 5). Finally, 86% of students reported being extremely (48%) or very (42%) satisfied with their own contribution to the project, and 10% were moderately satisfied.

Students' experience in and comfort level with conducting research varied widely (Table 6). Regardless of the number of years of pre-PharmD education, all students placed high importance on pharmacists' role in research. Students with the least amount of prepharmacy college education reported research was relatively more complicated yet more interesting, compared to students who had more than 3 years of pre-PharmD education. Students with fewer years of pre-PharmD education reported greater difficulty with the concepts of study

Table 4. Student Topic Selection and Project Description

Topic	Project Description
General Health	Perceptions of the affect of drugs and alcohol, exercise, and smoking cessation.
Dietary Health	Perceptions of caffeine intake; nutrition labeling; protein intake risks and benefits.
Oral Health	Perceptions of oral health education and general oral care.
Specific Medication Safety Issues	Perceptions of pseudoephedrine use; and over-the-counter medication use.
Infectious Diseases	Perceptions of antibiotics/bacterial resistance; vaccinations; universal precautions; and hygiene.
Neuropsychiatric Health	Perceptions of the impact of internet socialization on student mentality; sleep disorders; and stress.
Cardiovascular Health	Perceptions of cardiovascular health, care and education.
Women's Health	Perceptions of HPV vaccination; abortion; traditional birth control; and emergency birth control.
Professional Issues	Public perception of pharmacists' knowledge and expertise

Table 5. Questions for Students Regarding the Research Project and Students' Responses to Questions Related to Comfort with Self-Directed Learning and Satisfaction with Collaboration and Self-Contribution

Survey Question	Extremely Comfortable or Satisfied, %	Very Comfortable or Satisfied, %	Comfortable or Satisfied, %	Somewhat Comfortable or Satisfied, %	Not at All Comfortable or Satisfied, %
How comfortable are you with self-directed learning?	21	55	23	1	0
How satisfied are you with the group's collaboration on this assignment?	58	28	13	1	0
How satisfied are you with YOUR contribution to the work?	48	42	10	0	0

design, data collection, and statistical analysis compared to students with more years of education (Figure 1).

DISCUSSION

The majority of the mentorship and assessment of students was provided by 2 faculty members teaching various topics within Pharmacy Systems I. One faculty member possessed years of experience in many areas of pharmacy practice and teaching, while a junior faculty member contributed recent clinical and research experiences (ie, advice on ways to apply current health topics to public health) and resources (eg, institutional board templates from clinical practice sites) to guide students through the processes of topic selection, project approval and survey creation.

We felt breaking each deadline or component into a percentage of the Pharmacy Systems I Course would create a cumbersome process for us as faculty, and since each component was interconnected to subsequent steps in the project, we did not see a benefit in fragmenting each piece for the grading purposes. This approach to grading the project may have also helped us to maintain student focus on the broad approach to gradual integration of skills that build on one another, rather than fretting about passing each individual milestone.

Implementing this project helped us carry out activities allowing students to continue practicing and applying didactic concepts to public health and research and allowed us to become more familiar with our students' prior exposure to the process of discovery (Table 5). We found the most rewarding aspects of the project included: engaging in interactions with students throughout the semester; watching group presentations; and reviewing students' finished work. Students were able to meld information from didactic lectures and apply acquired knowledge in various activities such as: developing an

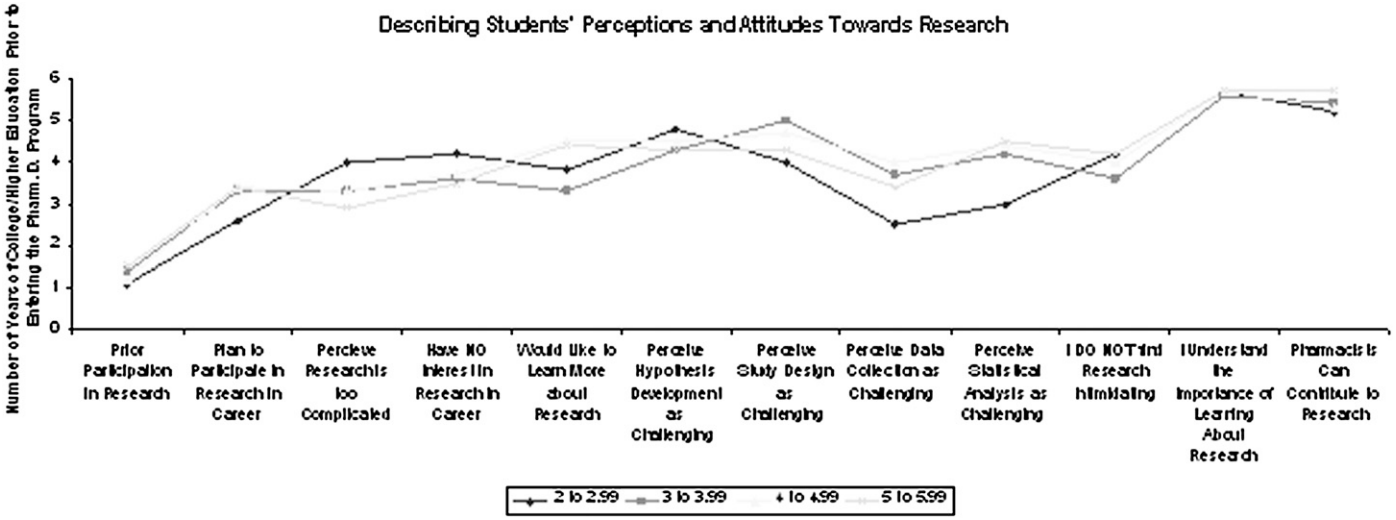

Figure 1. Relationship between first-year year pharmacy students' perceptions of research and the number of years of college completed prior to entering the PharmD program.

Table 6. Characteristics of Pharmacy Students Who Participated in a Research Project

Description	Characteristics
Groups and Gender Distribution	• Mostly male to mostly female groups were 11 (32%) to 18 (53%), respectively. • Groups with "mostly female" showed greater comfort with topics of greater social and controversial implications compared to "mostly male: groups. • All groups felt gender was an important part of their target demographics and included such items in their surveys.
Ethnicity	• In all groups, the major reported ethnicity was "Asian / East Indian." Not enough students from other ethnic classifications per group created enough of a majority to change the ethnic label of the group. • All groups addressed the question of ethnicity in their investigations, many classifying their results based on the cultural implications.
Student Education and Research Background	• All groups possessed a mixed ratio of students completing their Pre-pharmacy education at the school of pharmacy and students completing their Pre-pharmacy education elsewhere prior to matriculating to Pacific. • Among all groups, the average education years prior to starting the PharmD program was 3.89 years. Individually, the years of pre-PharmD education ranged from: 2-9 years. All groups had members with prior exposure to research. • All groups felt education level was a factor in subject responses and perception of their topics of investigation.
Student Ages	• In both "mostly male" and "mostly female" groups, the average ages were 23.7 years and 22.4 years, respectively. • Individual student ages ranged from 19-42 for mostly male groups and from 19-30 for mostly female groups. • All groups felt age was a factor in subject responses.

interest in a topic; creating a hypothesis-driven survey; analyzing results obtained by applying the tenets of study design; and synthesizing a final project. It is not too often that faculty members are able to see students apply the material they learn in the classroom. The project helped us to identify areas in which students needed additional practice/work before completing the course. Although time-intensive and exhaustive for the faculty, implementing this instructional component yielded advantages to the students' integration and application of the material. Also, the exercise allowed students to guide their own progress.

While the project received expedited review from the institution's review board, we did not consider having students gain IRB approval for each of their surveys. Future attempts to integrate a topic like this may require that students take their survey through their schools institutional review board. Gaining approval from the institutional review board rather than a pharmacy faculty mock IRB panel would have made students' work eligible for presentation at state and national pharmacy meetings and submission and possible publication in a peer-reviewed journal. By freeing up faculty time from having to review and approve each project, the faculty members could devote more time to creating a more rigorous assessment rubric for each presentation rather than the pass/no pass approach. Faculty implementing this type of activity in a course should communicate their needs of expedited review to their IRB and see if this type of project could realistically be carried out within their institution.

Upon completion of the semester, we found students had accomplished feats beyond the integration of skills across 2 courses. Intangible benefits included: student participation in early socialization with classmates; gaining appreciation for self-directed learning; and reflecting on their performance and perceptions of the pharmacist's role in research and public health education. Students were given the opportunity to collaboratively apply many skill sets in pursuit of a common goal. Reflecting on the entire semester, we were pleased with the outcome and only lament that we could not have incorporated more professors to increase the degree of collaboration amongst our faculty and reduce the burden of time and effort on the part of the involved faculty members. Educators in other schools in which the curricula can allow courses with content reflecting that found in Pharmacy Systems I and Pharmacy Biostatistics to concurrently occur may provide similar benefits to their students from collaborating with each other and integrating their classes and skill sets in similar projects. We hope our project can be implemented at other schools to provide an opportunity for students to apply the nontherapeutic and foundational concepts they are learning in class/through the didactic portion of the curriculum.

SUMMARY

Students' participation in team research projects during their first semester of pharmacy school allowed them to combine their didactic lessons with varied skill sets encountered during the first semester. Groups engaged in a variety of research projects addressing many of the public health concerns outlined in Health People 2010 as they interacted with the community. Individual students gained a high level of satisfaction during this project, working in teams and self-directing their own learning. First-year pharmacy students in other universities may benefit from participation in similar research projects during their first semester of pharmacy school.

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