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Experiences in Teaching and Learning

A unique degree program for pre-pharmacy education: An undergraduate degree in pharmaceutical sciences

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ABSTRACT

Background and purpose: Within the coming decade, the demand for well-trained pharmacists is expected to only increase, especially with the aging of the United States (US) population.

Educational activity and setting: To help fill this growing demand, the University of California, Irvine (UCI) aims to offer a unique pre-pharmacy degree program and has developed a Bachelor of Science (BS) degree in Pharmaceutical Sciences to help achieve this goal. In this commentary, we share our experience with our curriculum and highlight its features in an effort to encourage other institutions to enhance the learning experience of their pre-pharmacy students.

Findings: The efforts of the UCI Department of Pharmaceutical Sciences has resulted in UCI being consistently ranked as one of the top feeder institutions by the Pharmacy College Application Service (PharmCAS) in recent years.

Discussion and summary: The UCI Pharmaceutical Sciences Bachelor of Science offers a unique pre-pharmacy educational experience in an effort to better prepare undergraduates for the rigors of the doctorate of pharmacy curriculum.

Background and purpose

The demand for pharmacists to provide direct patient care is expected to only increase within the foreseeable future. This is mainly because of two contributing factors: the increase in the United States (US) average life expectancy from 75.3 years in 1990 to 78.8 years in 2012 and the increased prevalence of chronic diseases (living longer, but sicker), propelling the ever-increasing demand for prescription drugs.^{1–3} Indeed, from 1990 to 2010, the number of dispensed prescriptions for drugs has almost *doubled* (from 1.9 to 3.7 billion).⁴ Consequently, these factors have generated a “perfect storm,” as the growing demand for prescriptions further augments the national pharmacist shortage, beginning in the late 1990s, fueling the need for new pharmacy schools.⁵ In California alone, the number of pharmacy schools has increased more than three-fold since 1999.⁶ Yet, even with these additional post-secondary institutions, the national need for pharmacists is expected to continue its upward trajectory through 2020.⁷

Additionally, we are now facing a *new* shortage within the pharmacy workforce: a shortage of trained *pharmacist providers* who are also experts in preventive medicine and the management of chronic diseases. In California, the recent passage of Senate Bill 493, which mandates a broader recognition of Advanced Practice Pharmacists (APP), will make the emerging shortage of pharmacist providers more urgent.⁸

In California, the passage of Senate Bill 493 is expected to expand the roles for pharmacists in health care teams in an effort to improve the access, quality, efficiency, and affordability of the healthcare delivery system. Community pharmacists will now be able to provide direct patient care services, while directly billing insurance companies.⁹ Moreover, this approach has been cited to decrease the need for high-risk patients to enter hospitals, lowering overall healthcare costs.¹⁰ Therefore, it is critical that future

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doctor of pharmacy (PharmD) graduates have the training to assume this expanded provider role. Additionally, pharmacists are still crucial in settings such as drug discovery and development in academia and commercial research, as well as in regulatory sciences within the government agencies such as the Department of Public Health and the Food and Drug Administration.

To meet the new educational demands of the 21st century, the Accreditation Council for Pharmacy Education (ACPE) recently proposed new standards for the didactic and experiential educational requirements of the PharmD curriculum. Although a number of pharmacy schools are undergoing curricular reforms to follow these new standards, we believe that pharmacy education should start at the undergraduate level. According to the new ACPE standards and guidance, pharmacy graduates need to be “practice-ready” and “team-ready” in order to collaborate with other healthcare providers to provide patient-centered care.¹¹ By setting high standards of pre-pharmacy undergraduate education and by introducing PharmD courses at the undergraduate level, we hope to not only better prepare our students for the rigors of the PharmD curriculum and training programs (e.g., residency, fellowship), but also to better equip them as future healthcare providers.

To improve the pre-pharmacy education to meet this growing demand, University of California, Irvine (UCI) developed a Bachelor of Science (BS) in Pharmaceutical Sciences, graduating its first cohort in 2010, with the goal of offering a comprehensive undergraduate education for pre-pharmacy students to better prepare them for the rigors of the PharmD curriculum. Although UCI does not have a pharmacy school and is only in the early stages of developing one, it is currently the only west-coast institution to offer a BS in Pharmaceutical Sciences and one of only seven programs in the nation. In this manuscript, we share our preliminary experience with our curriculum and highlight its features in an effort to encourage other institutions to enhance the learning experience of their pre-pharmacy students.

Educational activity and setting

Overview

UCI has been ranked as the top feeder institution by the Pharmacy College Application Service (PharmCAS) in 2013-14 and 2014-15, with an average acceptance rate of 85% to pharmacy schools.¹² In 2007, UCI started offering a BS in Pharmaceutical Sciences in an effort to improve the pre-pharmacy education of this large applicant pool. At present, there are only seven universities in the US that offer a BS in Pharmaceutical Sciences, with UCI being the only west-coast institution (Table 1). The successful transition of UCI undergraduate pre-pharmacy students into graduate health-related programs attests to the high caliber of students and the supportive environment developed within the pharmaceutical sciences department. Based on the 2016 student exit survey (n = 106), over one-quarter of graduating seniors were enrolled in post-secondary health-related programs (PharmD, MD, PhD), with an additional 40% planning to pursue post-secondary education.

The teaching philosophy of the UCI pharmaceutical sciences curriculum is based on achieving five educational goals: 1) deep and conceptual understanding of the basic sciences, 2) critical thinking and problem-solving skills, 3) exposure to various fields in pharmacy through seminars and internships, 4) written and oral communication skills, and 5) knowledge of the importance of self-care and wellness. This approach is unique to UCI, which strives to expose undergraduates, beginning within the first year, to pharmacy-relevant coursework (Table 2). In order to achieve the first three goals, students are immersed throughout the four-year duration of the program to pharmaceutical-specific coursework and professional internships. In contrast, the majority of programs limit pharmacy-specific coursework to the final two years of study (Table 3), with the majority not being actively involved in helping students find valuable internships or connecting them with faculty mentors for undergraduate research. Additionally, to ensure students are equipped with strong written and oral communication skills, students are required to complete a course entitled “Speaking About Science,” that is dedicated to writing and communicating new advancements in biomedical and pharmaceutical sciences. Moreover, no program provides a course, such as “Life101,” that strives to instill within students the importance of self-care and wellness. “Life101” is focused on improving student mental and physical well-being, crucial not only in the highly stressful environment of an undergraduate science curriculum, but in the post-secondary PharmD setting.

Program specifics

A deep understanding of the basic sciences is an essential component of the pre-pharmacy curriculum at UCI. These courses not only provide a solid foundation for the more challenging science courses within pharmacy programs, but they also teach students

Table 1
Institutions that offer bachelors of science in pharmaceutical sciences.

Institution	Location
University of California, Irvine ¹³	Irvine, California
Purdue University ¹⁴	West Lafayette, Idaho
University of Rhode Island ¹⁵	South Kingstown, Rhode Island
City University of New York College ¹⁶	Jamaica, New York
University of Michigan ¹⁷	Ann Arbor, Michigan
Albany College of Pharmacy and Health Sciences ¹⁸	Albany, New York
University of Toledo ¹⁹	Toledo, Ohio

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