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A pharmacy student's role as a teaching assistant in an undergraduate medicinal chemistry course – Implementation, evaluation, and unexpected opportunities for educational outreach

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ABSTRACT

Background and purpose: To describe 1) a pharmacy student's teaching assistant (TA) role in an undergraduate medicinal chemistry course, 2) an active learning module co-developed by the TA and instructor, and 3) the unexpected opportunities for pharmacy educational outreach that resulted from this collaboration.

Educational activity and setting: Medicinal Chemistry (CHM3413) is an undergraduate course offered each fall at Palm Beach Atlantic University (PBA). As a TA for CHM3413, a pharmacy student from the Gregory School of Pharmacy (GSOP) at PBA co-developed and implemented an active learning module emphasizing foundational medicinal chemistry concepts as they pertain to performance enhancing drugs (PEDs). Surveys assessed undergraduate students' perceived knowledge of medicinal chemistry concepts, PEDs, and TA involvement.

Findings: Students' (total n = 60, three fall semesters) perceived confidence in knowledge of medicinal chemistry concepts and PEDs increased significantly ($p < 0.001$) after the TA's module. Nearly 93% of students acknowledged this was their first interaction with a TA at PBA, ~ 82% "agreed/strongly agreed" that the TA provided effective instruction, and ~ 62% "agreed/strongly agreed" that TA availability raised overall confidence in CHM3413. Unexpected "side-effects" of this collaboration included opportunities for the TA and instructor to discuss health risks associated with PED usage with student-athletes and coaches at PBA.

Discussion: This collaboration developed the pharmacy student's teaching skills and reinforced knowledge of foundational pharmaceutical science concepts for both the TA and undergraduate students. Unexpected "side-effects" that resulted from this collaboration included opportunities for the TA and instructor to discuss health risks associated with PED usage with student-athletes in PBA's athletic department.

Summary: Educational/interprofessional outreach opportunities resulted from a pharmacy student TA's involvement in an undergraduate medicinal chemistry course. An advanced pharmacy practice experience elective in sports pharmacy (based on Ambrose's model) begins Fall 2017.

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Background and purpose

The undergraduate academic programs at Palm Beach Atlantic University (PBA) are touted as having "174 full-time faculty" and "0 teaching assistants".[1] Indeed, students can receive personal attention from their professors throughout their education at PBA. Without traditional graduate degree programs in the basic sciences (e.g., masters and/or doctoral degree programs in chemistry and biology), there are no graduate students available to serve in a teaching assistant (TA) capacity in any undergraduate course. While one-on-one student-professor interactions are important, the potential benefits of involving a properly mentored TA in an undergraduate course have yet to be fully explored at PBA and could potentially prove beneficial to both faculty and students.[2,3] Immediate benefits of a TA presence range from offering additional tutoring to review course materials and work on problem sets to assisting the instructor with the development and delivery of new course content.

PBA offers an undergraduate Bachelor of Science degree in Medicinal and Biological Chemistry. The course Medicinal Chemistry (CHM3413) is an introduction to medicinal chemistry and is generally a student's first opportunity to apply general, organic, and biochemistry concepts to the fields of medicine, pharmacy, and drug discovery.[4] Application of chemistry in this manner is typically reserved for the doctor of pharmacy (PharmD) curriculum (e.g., courses such as Principles of Drug Action I and II).[5] CHM3413 is typically populated with sophomore through senior level students majoring in medicinal and biological chemistry or biology, nearly all of whom are on a pre-pharmacy or pre-medicine academic track at PBA. When asked on the first day of class what they expect from this course, students generally express excitement at the opportunity to see the application of the chemistry and biology studied in other undergraduate courses. Others express a modicum of apprehension as they are uncertain as to what to expect from a "graduate school pharmacy professor" teaching an undergraduate course and introducing new topics such as drug structure-activity relationships, pharmacophores, and physico-chemical properties for the first time. It was thought that some of the apprehension and uncertainty associated with taking this upper-division course could be ameliorated via the incorporation of a TA, particularly a student that had excelled in the course as part of their pre-pharmacy curriculum at PBA.

The challenges and merits to training and mentoring effective graduate student TAs in chemistry-related courses at institutions of higher education have been discussed at length.[6,7] Regardless of discipline, providing a training or introductory opportunity for a graduate student to gain teaching experience without the burden of full responsibility for a course is generally preferred.[8–10] While the utilization of a TA at the university level is not a novel idea, a search of the literature does not reveal a "*pharmacy student TA in an undergraduate medicinal chemistry course*" combination. CHM3413 has been offered at PBA each fall semester since 2007, without the involvement of a TA. Upon implementation at PBA, the use of a pharmacy student as a TA in an undergraduate level medicinal chemistry course would almost certainly be unique. This collaboration, if successful, might even provide a pathway for similar partnerships where highly qualified students serve as TAs for instructors in other disciplines throughout the university.

Recruitment of the pharmacy student TA

The idea to use a well-qualified first year pharmacy student interested in serving as a TA in an undergraduate medicinal chemistry course was proposed to university administration in the Gregory School of Pharmacy (GSOP) and School of Arts and Sciences (SAS). It was argued that the relatively small class size (i.e., typically less than 30 students) would facilitate close interaction among the students, professor, and the TA. This would allow feedback to be gathered and utilized in a timely manner to refine the TA's role with each subsequent semester of involvement in the course. The undergraduate students' perceptions of the TA would be surveyed each fall semester over the span of three years (i.e., three fall semesters) corresponding to the TA's first three years in pharmacy school.

Merit-based awards known as Pharmacy Honors and Service (PHS) scholarships are offered to students accepted to the PharmD program at GSOP.[11] Once awarded, the student must maintain a minimum grade point average in the pharmacy curriculum and complete professional service hours each academic year. Typically, service hours are completed by students working in various areas of the pharmacy school including admissions and recruitment, research, technology and media services, the Office of the Dean, and student services. With the permission of the dean, the area of "research" was broadened to include the opportunity for a pharmacy student to serve as a TA in an undergraduate pre-pharmacy course. In this manner, a well-qualified and highly motivated student could essentially impact their own development and even bolster their curriculum vitae with a unique TA experience all while still in pharmacy school.[12] Approval was ultimately granted and modest funding to carry out and report on the pilot project was awarded by the university in the form of an internal Quality Initiative (QI) research grant.[13]

The ideal candidate for the pharmacy student TA position would be a first-year pharmacy student that had enrolled in CHM3413 prior to acceptance to GSOP and earned a grade of "B+" (85%) or greater. TA selection criteria and rationale are listed in Table 1. Several first-year PHS scholarship recipients were interviewed and the selected candidate began to serve as the TA in the fall 2012 semester.

Educational activity and setting

CHM3413 has been taught by an individual faculty member at PBA since 2007 as part of the undergraduate curriculum for the Bachelor of Science degree in Medicinal and Biological chemistry.[4] This faculty member holds a dual appointment in both GSOP Department of Pharmaceutical Sciences and SAS Department of Chemistry at the university. While the university offers peer tutoring services for other undergraduate level chemistry courses, there is no such offering for CHM3413. Traditionally, most tutoring has been carried out during faculty office hours by the faculty on record for the course. It was thought that perhaps a pharmacy student functioning as a TA for this course, particularly one that successfully completed the course as part of their pre-pharmacy curriculum, would be well-suited for peer tutoring for CHM3413.