

Teaching Science through Biomedical Research in an Elective Curriculum

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The objective of the research Scholarly Concentration (rSC) at USF-MCOM is to guide the engagement of medical students in biomedical research. The long-term goal of the rSC is to foster the growth of physician scholars. Here we report and discuss the outcome of this program for the past six years.

The Scholarly Concentrations Program (SCP) at the USF Health Morsani College of Medicine (MCOM) was initiated in 2007 to foster the intellectual growth of its students within the larger context of medicine beyond the core medical curriculum¹. Specifically, the students participate in a longitudinal curriculum and are mentored to participate in areas of inquiry related to their concentration focus. The research Scholarly Concentration (rSC) is one of ten different scholarly concentrations: Innovation, Entrepreneurship and Business, Health Disparities, Health Systems Engineering, International Medicine, Law and Medicine, Medical Education, Medicine and Gender, Medical Humanities, Public Health and Research. Although the SCP is an elective program, student enrollment has consistently increased since its inception and now comprises > 90% of the class of 2015. Here we report and discuss the outcome data of the rSC as a model to teach basic research skills and expand the study of biomedical sciences during undergraduate medical education.

Brief description of the rSC program: The overall objective of the rSC is to prepare the incoming students to identify and engage in a research project and to provide them with the basic research skills to successfully complete the project. For this purpose,

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the rSC together with all concentrations starts recruiting students at the beginning of year one through three mechanisms: a faculty led introduction, a student centered round robin event and an annual SCP symposium, where students from all concentrations and all years have opportunity to present their scholarly work. Following these events, students submit their applications. Upon acceptance, the students enroll in the rSC elective course that is partly congruent in time between year one and two. The curriculum of this course consists of seminars given by senior students, journal clubs, scientific success skills and didactic sessions in research methods, study design and biostatistics. A pool of research mentors has been recruited from USF Health and the H. Lee Moffitt Cancer Center and the rSC leaders facilitate the matching of student and mentor. The foundations of the research project are developed in the summer between years one and two. Students conclude their research projects by working intermittently during second year and during up to three elective periods in third and fourth year. Each student is required to submit their work once during their tenure at USF-MCOM at the annual USF Research Day. Thus, this program offers training in scientific research in addition to the core competencies taught in the required medical curriculum. Long-term outcome data from programs such as this may contribute to making informed decisions about the scope of scientific research core competencies necessary in the core medical curriculum.

The success of the program with respect to publication has steadily increased for the classes of 2009-2012 and current data for the classes of 2013 and 2014 indicate a continuation of this trend (Table 1). Particularly noteworthy is an increase in student participation at national symposia

beginning with the class of 2011. In our opinion these successes represent the increased commitment of the mentors to the program. The rSC leaders have recruited and guided mentors to understand the unique needs of medical students

with respect to time constraints and the need for mentoring. Possibly, participation at national meetings has further motivated the students to conclude their work by publishing original articles.

Graduating Class	# of Students	Peer-reviewed Article	Abstract	Oral presentation	Poster Award	Case Study	Review	Manuscript submitted	Manuscript in preparation
2009	5	11							
2010	7	4	3						
2011	12	11	11	1					
2012	21	16	17	9	2		1	7	4
2013	25	2	8	7	3	2		1	3
2014	9		1	2					2

Table 1. Number and Types of Publications by rSC Students for the Graduating Classes 2009-2014

Enrollment in the rSC has steadily increased in parallel to the overall increased enrollment for the entire SCP with the exception of the class of 2014 (Figure 1). Interestingly, the attrition rate was highest in the class of 2012, which also had the highest enrollment. Half of all the students who withdrew did so during the first year, just prior to or shortly after starting the research project. Surprisingly, only 10% of all the students that withdrew did so during third and fourth year. The

high attrition rate for the class of 2012 during the beginning of the program is, in our assessment, a reflection of insufficient numbers of experienced mentors and the realization by students of the stringency of a four-year commitment. Consistent with reports by others we have found that a close mentoring role is needed to adequately guide the students through the process of designing and carrying out research projects successfully.^{2,3}

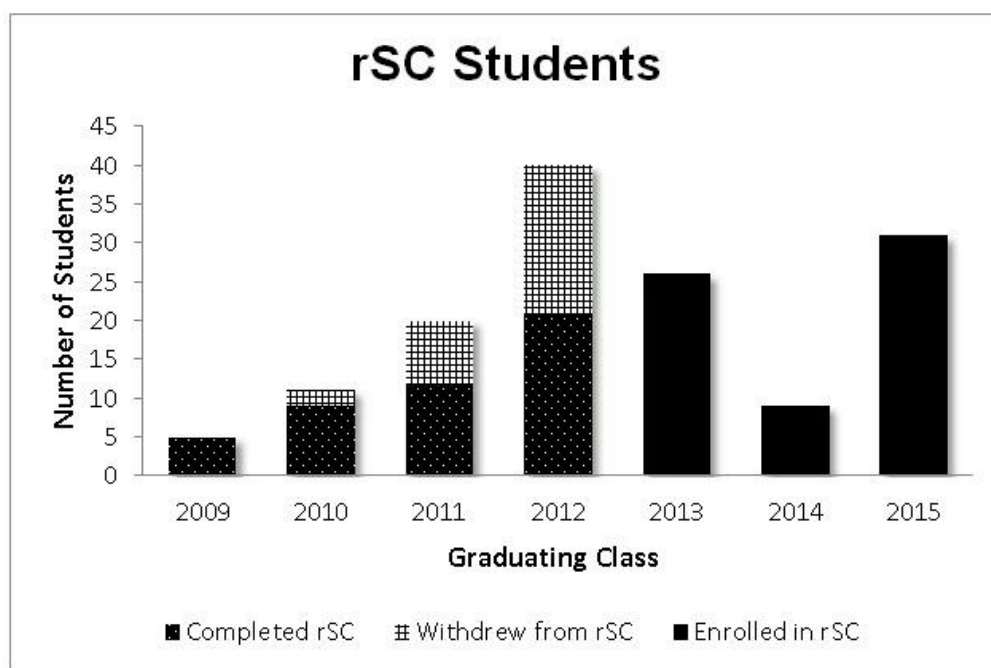


Figure 1. Enrollment and Attrition for rSC Students for the Graduating Classes 2009-2015

Furthermore, while many medical students engage in short-term research for the perceived goal of enhancing their application for residency, the goal of the rSC is to foster the scientific discourse beyond the obligatory research experience. To address the high attrition rate of the class of 2012, we emphasized this four-year commitment during subsequent recruitment processes and discouraged students who wanted a more limited research

experience. Together, the increased availability of committed mentors and the clearly communicated commitment to a four-year experience resulted in a significant decline of attrition during the first year for the classes of 2013 and 2014, albeit at a lower overall enrollment. Enrollment increased again for 2015, which we attribute to the visible success of our senior students.

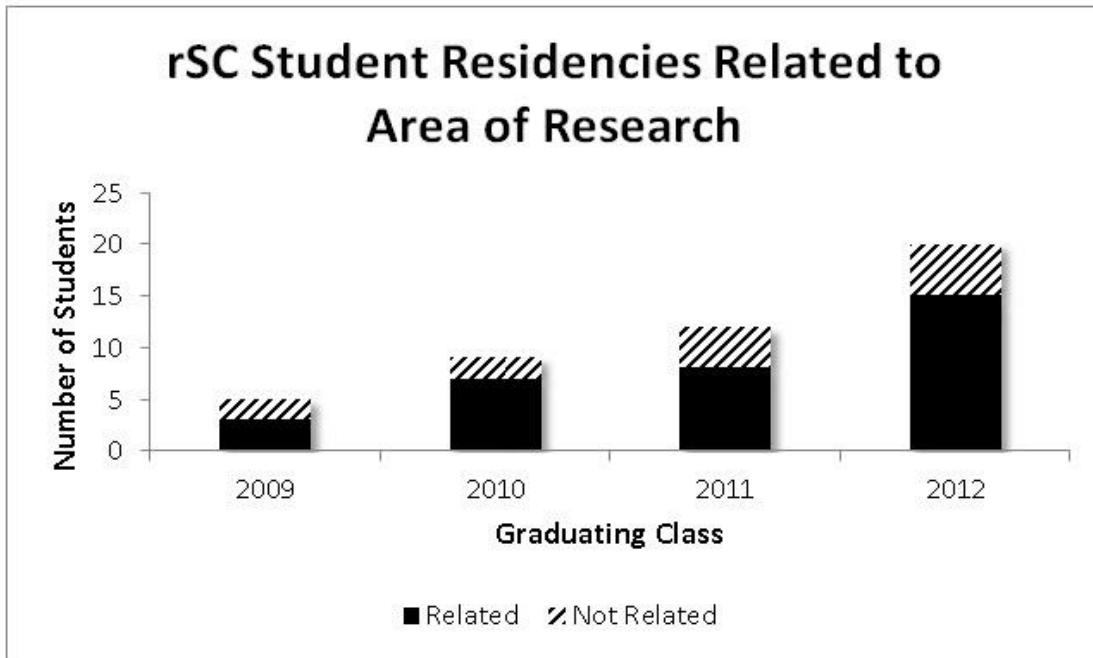


Figure 2. Correlation of Area of Research to Choice of Residency for the Graduating Classes 2009-2012

Match data for the classes of 2009-2012 indicate that the area of research was concordant with the choice of residency with an average of 70% +/-8.1 (Figure 2). Notably, this correlation of research and residency match has been also observed for similar programs.⁴ Studies are currently being conducted to determine whether the choice of research influenced the choice of residency or vice versa.

Data from the last six years of our elective research scholarly concentration show a growth in student research, publications and talks. They also suggest that success of the program as measured by recognition of the work within the scientific community relies on close contact of the mentors and the student mentees, and the self-selection of students who perceive a long-term scientific commitment as educationally valuable. Thus, the role of the concentration leader in recruiting and maintaining an optimal mentor pool is crucial. As has been reported for similar programs we cannot yet determine whether we achieved our long-term

goal of integrating scientific thinking into the practice of medicine.⁴ Nevertheless, qualitative data collected from students' reflections upon graduation suggest that the rSC program realized to some degree its goals and objectives. Reflections include statements that the rSC enabled a better understanding of basic science and clinical research and that the rSC allowed for an appreciation for the actual process of research and its impact on clinical practice. Students reflected that the rSC allowed a rewarding expansion of the medical school experience and that it shaped their vision of how clinical practice should be. Students commented on their research project per se stating that it gave a better idea of the importance and challenge of basic research and clinical treatment. Several students stated that they plan to continue research endeavors throughout the residency years and many felt that having the opportunity to be in the rSC was one of the most rewarding aspects of their medical school education. In conclusion, long-term follow-up will produce the data necessary to determine whether

the rSC experience translated into a more scientific approach to clinical practice. However, the outcome products, including talks, papers, abstracts, and personal reflections on the experience, indicate a positive impact of this concentration on the scholarly growth of its graduates.

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