Teaching Scientific Research Skills in an Elective Curriculum: Obstacles, Opportunities and Outcome

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The biomedical research scholarly concentration (rSC): Objectives and Goals

- The **objectives** of the Research Scholarly Concentration are to provide a **curriculum** for **scientific training** and to aid with the **research experience** with the long-term **goal** to foster the student competency to practice science based medicine.

rSC: Goals and Objectives cont'd

- **Specifically**, the Research Scholarly Concentration program will:
- provide the students with a supportive frame work for identifying research interests and aid in finding a research mentor with whom to develop a hypothesis.
- identify funding agencies to which students may apply and to facilitate competitive research proposals.

rSC: Goals and Objectives cont'd

- provide a curriculum that will teach tools for conducting research
- provide a forum to develop scientific thinking and presentation skills.
- facilitate recognition at the time of graduation

rSC: Program Outline

Year	*Research*
1	Year I (Fall) Experimental Design, Bio-statistic, Responsible Conduct in Research Participate in the course and in the additional regular meetings of the concentration Year I (Fall-Spring) Identify research mentor and write a proposal Year I (Summer) Work on the foundation of your research project
2	Participate in the course and in the additional regular meetings of the concentration Submit your work-in-progress for presentation at the annual Scholarly Concentration Symposium in the fall. Submit your work for presentation at USF Research Day in February Continue to stay in touch with your mentor. Continue to work on your project as time allows.
3	Participate in the regular meetings of the concentration as time allows Analyze your data and prepare outline of a manuscript Use elective time to possible conclude or expand the research project
4	Participate in the regular meetings of the concentration as time allows Use the elective time to possible conclude or expand the research project Submit manuscript Give a final presentation to the members of the concentration

rSC: Curriculum

- Statistics and Experimental Design
  - Explanation and application of basic statistical methods
- Responsible Conduct in Research
  - Training on how to develop a clinical study and write the IRB protocol
- Research Success Skills
  - Instructions on how to prepare a poster, talk, research proposal and resume
- Practicum in Experimental Methods
  - Typically given by research mentor

rSC: Curriculum cont'd

- Journal club in Biomedical Science Research
  - This course will provide students with experience in reading and critically evaluating research literature. After an introduction in how to read scientific articles, students will present a journal article of their choosing.
- Seminars in Biomedical Science Research
  - Second and fourth year students will present their research findings

rSC: Opportunities, Obstacles, Outcome

- Opportunities
  - To teach scientific inquiry in the face of expanding scientific knowledge
    - Scientific literacy
    - Lifelong learning
- Outcome evaluation
  - Publications
  - Student evaluation of the program
- Obstacles
  - The clinical years
  - Projects and research mentors
  - Data collection to evaluate the program

rSC: The Clinical Years

- The schedule of 3rd year allows for insufficient time
  - to engage in research
  - to participate in the rSC meetings

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- Possible solutions
  - *Create elective periods for SC work to continue*
    - 1 month elective period in 3rd year
    - 2x 1 month elective periods in 4th year
  - *Development of student mentor system*
    - to continue to engage the student in 3rd year
    - to increase the success of the project

rSC: The Clinical Years

- Create elective periods for SC work to continue
  - 1 month elective period in 3rd year
  - 2x 1 month elective periods in 4th year
  - 35% of students from the classes of 2012 and 2013 enrolled in elective periods
- Development of student mentor system
  - 23% of the students in the class of 2016 are taking on research projects started by senior students

rSC: Projects and Research Mentors

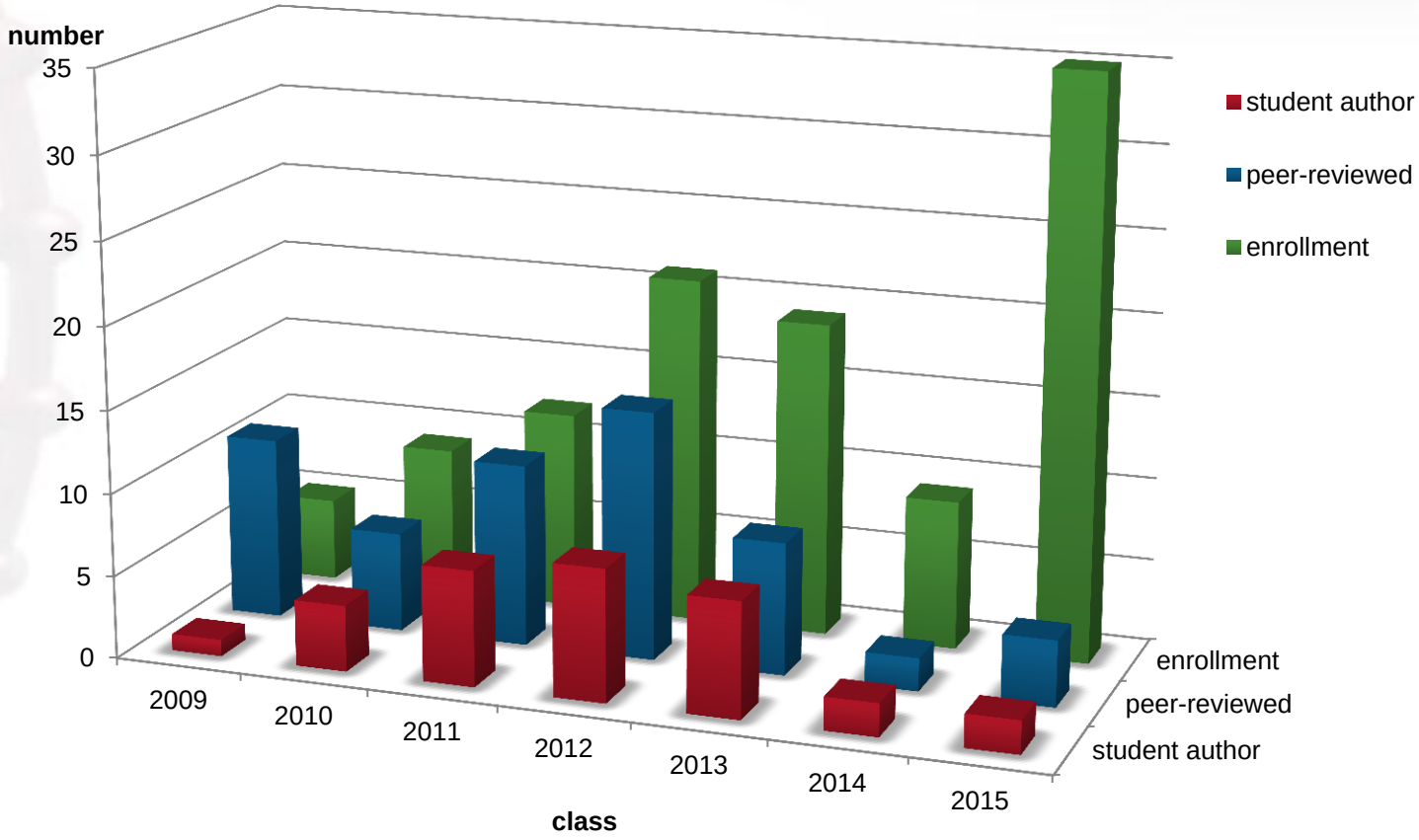
	AY09-10										
	hdSC	hseSC	bSC	imSC	lmSC	eSC	mhSC	mgSC	phSC	rSC	TOTALS
Published Papers	0	0	0	1	0	0	0	0	0	3	4
Abstracts/Posters	1	0	3	2	0	1	0	0	0	7	14
Research Day	0	0	0	0	0	0	0	0	0	12	12
Oral Presentations	0	0	1	0	1	0	0	0	0	2	4
Awards	0	0	1	3	0	0	1	0	0	1	6
Graduation Recognition	2	0	0	5	0	4	0	0	0	8	19

	AY10-11										
	hdSC	hseSC	bSC	imSC	lmSC	eSC	mhSC	mgSC	phSC	rSC	TOTALS
Published Papers	0	0	0	1	0	0	0	0	0	19	20
Manuscripts submitted/or in preparation	0	0	0	0	0	0	0	0	0	16	16
Abstracts/Posters	2	0	9	0	0	1	0	0	0	45	57
Research Day	3	0	2	3	1	0	0	2	0	17	28
Oral Presentations	4	2	0	2	0	2	0	2	0	14	26
Awards	0	0	0	1	0	2	1	0	0	7	11
Graduation Recognition	9	1	3	6	0	0	0	0	0	12	31

	AY11-12										
	hdSC	hseSC	bSC	imSC	lmSC	eSC	mhSC	mgSC	phSC	rSC	TOTALS
Published Papers	2	0	6	4	0	0	1	1	0	13	27
Manuscripts submitted/or in preparation	0	0	0	0	0	0	0	0	0	11	11
Abstracts/Posters	2	0	10	2	0	2	0	3	1	21	41
Research Day	3	1	2	0	1	0	0	2	1	17	27
Oral Presentations	4	3	9	2	0	0	0	2	1	8	29
Awards	2	1	1	0	0	2	0	1	1	4	12
Graduation Recognition	7	0	2	6	4	1	0	0	2	21	43

3 Year Summary as of June 2012	
Published Papers	51
Manuscripts submitted/ or in preparation*	27
Abstracts/Posters	112
Research Day	67
Oral Presentations	59
Awards	29
Graduation Recognition	93
*recorded from rSC starting AY10-11	

rSC: Projects and Research Mentors



rSC: Projects and Research Mentors

- The data clearly indicates the crucial contributions of the mentors
  - PI leave institution
  - PI have funding problems
  - PI commitment to the program
- No correlation could be determined of whether any of the following affects the outcome
  - degree of the mentor (PhD, MD or MD/PhD)
  - nature of the research (bench, clinical)

rSC: Projects and Research Mentors

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  - PI leave institution
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  - PI commitment to the program
- Possible Solutions

➢ *Continuous development of the mentors*

➢ *Recognition of mentor by the institution*

➢ *Develop student mentor program*

rSC: Data Collection to Evaluate the Program

- Counting the number of peer-reviewed publications
  - is problematic, e.g. “I submitted one paper and am currently working on the next”
  - is just one parameter that may not necessarily measure achievement of scholarship

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- Possible Solutions
  - Develop on-line portfolio system
  - Develop survey of students

rSC: Data Collection to Evaluate the Program

- **How has the Scholarly Concentrations Program helped you as a scholar?**
- **Has your experience in your selected concentration influenced your career direction?**

rSC: **How has the Scholarly Concentrations Program helped you as a scholar?**

- *Class of **2013**: 68% response rate, 100% positive impact,*

➢ “The scholarly concentration profram has allowed me to integrate what I am learning in the classroom into a real-life project. It has helped me see where medicine is going and why we are being taught chemical level details.”

rSC: **How has the Scholarly Concentrations Program helped you as a scholar?**

- *Class of **2014**: 90% response rate, 100% positive impact,*

➢ "Scholarly concentration has provided avenues where medical students can explore other passions in the medical field that can be incorporated into patient care. In my experience, it has allowed for more incorporation of evidenced based medicine into my clinical decisions."

➢ "I have learned much more about reading and writing scholarly articles and abstracts. My lab skills have been improved, I have also had the opportunity to step out of my comfort zone and present at a national research Congress, I am very pleased with how much this scholarly concentration has created and honed skills and helped me grow as a future doctor,"

rSC: **How has the Scholarly Concentrations Program helped you as a scholar?**

- *Class of **2015**: 100% response rate, 100% positive impact,*

- "I've learn to better appreciate the importance of research in enhancing and further developing the field of medicine and the importance of keeping up with the current medical literature."
- "The Research SC has helped me become more organized and thorough in my research work as well as my class work. I have learned to be more efficient when searching literature and have applied what I learned about thorough analysis in my activities as a student.

rSC: **Has your experience in your selected concentration influenced your career direction?**

- *Class of **2013**: 68% response rate, 92% positive impact, 8% negative impact*

- "It has not influenced my choice of residency, but it has prepared me for doing research during my residency. I feel more comfortable creating posters, writing abstracts and giving oral presentations"

rSC: **Has your experience in your selected concentration influenced your career direction?**

- *Class of **2014**: 100% response rate, 80% positive impact, 20% negative impact*

- "It has made me reconsider doing research in the future."
- "I know I would like to continue with research during my entire career."

rSC: **Has your experience in your selected concentration influenced your career direction?**

- *Class of **2015**: 100% response rate, 86% positive impact, 14% negative impact*

- "Yes, it has opened my eyes to a career with both a clinical and research orientated practice".
- "The concentration has allowed me to learn more about basic science research. I plan on making research a part of my practice as a physician, and this work has allowed me to develop my practical skills as well as my ability to think critically about scientific work. I have spent and will continue to spend considerable time with the primary literature, and this will only help me as I move into the clinical setting. Additionally, I am eager for the opportunity to share this work through various meetings, and potentially publications."

rSC: Have the long-term goal been reached?

- Students in the rSC classes of 2013-2015 have universally acknowledged growth as a scholar
- The majority of students in the rSC classes of 2013-2015 rate the research experience as a positive impact on their career direction
- The number of students who continue into a residency related to their area of research has steadily increased

rSC: Has the long-term goal been reached?

- Has the “acknowledgment of growth as a scholar” affected the classroom performance?
  - Preliminary data indicate no difference in exam performance in Year 1 and 2 between rSC students and their peers
  - Is this the right control group? The majority of students are enrolled in the Scholarly Concentration Program and engaged in scholarly inquiry

rSC: Have the long-term goals been reached?

- How will the research experience affect the practice of medicine?
  - Consider survey through alumni organization
  - Consider residency survey
  - Consider social media

The role of the elective rSC in teaching scientific competency

- Collaborate with EBM course
  - Curriculum in ‘Statistics and Experimental Design’ and ‘Responsible Conduct in Research’ to complement EBM curriculum

Which of the following poses a challenge for medical students to have a successful research experience?

A. Data collection
B. The clinical years
C. The mentors

Which of the following poses a challenge for medical students to have a successful research experience?

A. Data collection
B. The clinical years
C. The mentors

Answer: B and C are correct, A only indirectly

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