



COS STEM Accelerator Faculty

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The STEM Accelerator Program

The STEM Accelerator program was created by the College of Science in 2011 with a focus on the success of undergraduate students. In particular the program has been tasked with four major goals of increasing the number of STEM majors, improving retention rates of STEM students, reducing their time to graduation, helping them join the STEM workforce or continue their education upon completion of their Bachelor's degree in STEM disciplines. Created as an interdisciplinary unit, this division consists of faculty members from multiple departments. These faculty have special responsibilities besides teaching that includes coordinating and promoting STEM activities for COS that help achieve the four primary goals. Currently, the program includes faculty from Mathematical Sciences, Undergraduate Biology Program, SPACS, Forensic Sciences, AOES and Chemistry. The program also works closely with the Prince William Governor's School @ Innovation Park high school program. Watch a video about us at: <http://player.vimeo.com/video/72849996>

The Learning Assistants Program

One of the hallmarks of the program is to support the retention and reducing the time to graduate in the college is the Learning Assistant (LA) Program. This peer-to-peer program gives undergraduate STEM students the opportunity each semester to engage in face-to-face and online collaborations to help reinforce content taught in the classroom. The LA program has three main goals: (a) Facilitate the learning of undergraduates in classrooms, labs, help rooms, and other venues through the use of LA's who understand the material and attend the course lectures; (b) Deepen the LA's understanding of important concepts of the course in which they are working by having them assist the learning of other undergraduates and; (c) Expose LAs to the process of teaching and learning through weekly workshops and hands-on teaching experience. In Fall 2013, the program supported 38 LAs who work 10 hours per week and they meet 300 - 400 COS majors who need help in gatekeeper classes such as Organic Chemistry, College Physics, Cell Biology, Biostatistics, Genetics and Calculus. After the Fall semester, the program would have impacted about 5000 COS students. The LAs meet each week to receive pedagogical training from the STEM Accelerator faculty on how to best help the students learn. All 38 LAs were also invited to present a poster that showcases their work as an LA and their experiences. One student shared "By helping the students understand the material, I was able to test my own knowledge and better understand the material as well." Another student shared that, "Being a LA has also helped to reinforce my own knowledge in preparation for graduate school and to build confidence in my ability to teach at the college level in the future."



"Overall, I learned that teaching is a career that I am interested in pursuing and that there is nothing better than helping students understand science!"



"After learning more about Mason and its Honors College and its Research Program, Mason has definitely been pushed up to one of my high priority schools."



EXTREME SCIENCE at Change the World STEM Event

The College of Science and STEM Accelerator Program at GMU presented EXTREME SCIENCE booth at the "Change the World" STEM Careers Fair at Dulles Town Center Mall (Sept 27-28, 2013). The event was co-sponsored by Congressman Frank Wolf and the National Science Foundation for middle and high school students, teachers and families. "Extreme Science" which is the COS exhibit was showcased at the Dulles Town Center Mall, opposite the Cheesecake Factory. The LAs and undergraduates worked with faculty to make this event a grand success.

A Model for Future High School COS Visits

The STEM Accelerator program helped organize the first ever Governor's School @ Innovation Park high school program GMU COS Visitation Day on Nov 22, 2013. The program included visits to various labs in biology, chemistry, physics; research presentations from faculty; demonstration in the Collaborative Active Learning with Technology Room; COS Academic Programs; Honors College; lunch at Southside along with opportunities to informally interact and socialize with current COS Mason students and faculty. Our goal in creating this COS visitation was to give juniors and seniors in high school a showcase of what COS has to offer. Such an event is essential for these students to help them possibly consider Mason as a potential place to go for their undergraduate studies. We have received many commendations for organizing this first time academic and outreach event in COS. A student shared *"I would like to thank you for such an informative and enjoyable tour and presentation! After learning more about Mason and its Honors College and its Research Program, Mason has definitely been pushed up to one of my high priority schools. I was also thinking of pursuing a minor in Mathematics, but we can talk more about that if I decide to come. I am particularly interested in contacting the Chemistry Biochemistry dual degree student who we sat with at lunch, as well as the Biology faculty who we met with at the beginning of the day."* The director of the Governor's School Dr. Karen Dalfrey also was very excited about this visit who joined the students for the day. She said, *"Thanks once again to everyone for all your time and efforts for offering the tour for our students on Friday. I believe it was very beneficial for these students to see what Mason COS had to offer. They were very excited to learn about COS programs, as well as to experience the Fairfax Campus. I really appreciate the help from the STEM accelerator faculty, COS Department Chairs, Assad Khan, and of course Richard Friesner and Padhu Seshaiyer for all the time you put into this day."*

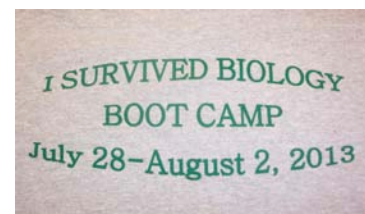
Einstein Fellows Partners with Mason

The STEM Accelerator and the Triangle Coalition are partnering with Fairfax County Public Schools on an innovative opportunity to work with some of the world's most accomplished science and math teachers: Einstein Teaching Fellows. These Fellows are K-12 teacher leaders who work in federal agencies and congress for one year, and they bring outstanding knowledge about effective math and science instructional practices. The STEM Accelerator program hosted the 2013-2014 cohort of Einstein Fellows at GMU on June 27, 2013. Plans are currently underway to use this partnership to address a challenge brought about by Myra Thayer, Science Coordinator of FCPS who indicated the great need to promote more awareness of science education. The proposed work will involve the Einstein Fellows partnering with FCPS and GMU to provide at least one authentic STEM experience for each student. Starting in the spring 2014, the Einstein Fellows will support eight preselected elementary schools within Fairfax County and will work with designated lead teachers at each school to identify needs and create relationships to help meet those needs. Reid Schwebach and Padhu Seshaiyer from the STEM Accelerator are leading this effort and currently have formed an advisory board. Alongside and supporting this effort, the advisory board and subcommittees will identify best practices, with the intent to replicate this partnership with future Einstein Fellows and school districts.



Bio Boot Camp - Seeks to propel academic success of freshmen

Mason's Biology Undergraduate Program has over 1,500 students enrolled, which makes it the largest major in the entire University. To help bridge the gap between students successfully completing a four-year STEM degree and those who change majors after the first academic year to non-STEM majors, the Biology Boot Camp is a unique program designed through the STEM Accelerator to increase retention of first-time full-time students who have declared biology as their major. The objective of the Camp is to expose Mason students to the rigors of college since they have recently graduated high school. *"The biology boot camp is a great opportunity for students to begin strengthening their weakest areas, be it academic or social. During the week, students are given many opportunities to become familiar with the fast pace of college life and develop learning communities which are essential for any STEM major,"* says Dr. Claudette Davis the principal coordinator of the event. In Summer 2013, twenty-three students attended the boot camp and participated in actual lectures of the first course biology majors take, Cell Structure and Function (Biology 213). The lectures, given by Cell Biology faculty, were based on content covered in Biology 213. Student took mock exams (three lecture exams and one final exam) and were also engaged in discussion of the different learning styles and how to successfully take notes. Current Mason STEM students (Sophomores, Juniors and Graduate Students) also interacted with camp participants through informal breakout sessions to allow participants to discuss the day's lecture material. The breakout sessions ultimately turned to conversations about Mason and what is like to be a student here. The learning communities built during the week-long camp allowed students to focus on successfully performing in Biology 213 and their other courses during the fall semester. Students also had the unique opportunity to meet faculty who teach the core courses all biology majors must take as well as other STEM Accelerator faculty who have a vested interest in their education while students at Mason. We are currently studying the 23 students from the camp longitudinally and are seeing superior success rates in their quizzes and exams. The success of these boot camps here as well as other institutions leads us to believe that students would benefit from boot camps in other STEM courses also.



"I feel as if I'm hitting the ground running after boot camp."

"Interacting personally with professors is a great opportunity, as students aren't able to have that connection sitting in a 100-person lecture hall."



Disseminating Effective Educational Research and Pedagogical Practices

The Discipline Based Education Research (DBER) is an interdisciplinary forum through which faculty and others interested in science education can join in discussions regarding effective education. This group allows an open forum for faculty (and, other interested individuals) to present their experiences, ideas, research and observations gained through effectual science education. DBER has helped to create a forum for discussion of new ideas and help faculty learn how they can improve their teaching and research in a supportive environment. Topics have varied from discussions on various types of classroom assessments, learning styles, effective teaching strategies, collaborative learning, science communication, research ethics and many more that can impact faculty development. Fall 2013 speakers included:

- Dr. Katherine Rowan, Science Communication "Elevating Your Science Elevator Talk and One Pager" (Oct 8, 2013)
- Dr. Julia Nord, AOES and STEM Accelerator, "Using primary literature to enrich the undergraduate experience" (Nov 5, 2013)
- Dr. Erin Peters Burton, College of Education and Human Development, "Inclusive STEM High Schools: Developing Social Capital to Improve Opportunities and Rigor" (Nov 22, 2013)

If you are interested in participating, email: pseshaiy@gmu.edu

Reviewing through ORALS

Oral reviews are optional, ungraded small group sessions of 5-6 students who work at white boards. A facilitator asks conceptual questions and students explain their thinking verbally or through graphical representations. This approach has been shown to improve student performance in these "gateway" math courses that is spearheaded by Dr. Mary Nelson. The average exam score of students who participated in oral reviews was more than about 15% on an average than those who did not participate. Since this has been successful, currently this strategy is extended to other STEM "gateway" classes.



Scholarships for future K-12 teachers

The STEM Accelerator Program coordinates the Robert Noyce Teacher Scholarship which is a five year \$1.5Million grant from the National Science Foundation to support a program to prepare future secondary school teachers in science, technology, engineering, and math (STEM) disciplines. *"This is a great opportunity for the COS to contribute to President Barack Obama's call for 100,000 new STEM teachers over the next decade,"* says Mary Nelson who is the Principal Investigator and who helped implement a Noyce scholarship program at the University of Colorado-Boulder before coming to Mason. Besides helping support twenty Learning Assistants each year through the program, the grant also supports Noyce Scholars who receive \$10,000 per year in tuition support for up to three years in return for their commitment to teach for two years in a high-needs school district for every year as a Noyce Scholar. Our first Noyce Scholar Jody Shipp is currently employed in Chantilly HS in FCPS.

Awards and Accolades

AFCEA DC Chapter Awards: In June 2013, AFCEA (Armed Forces Communications & Electronics Association) DC recognized one of our Learning Assistants and NOYCE fellow Mr. Micah Mysiuk at their annual event.

Nifty-Fifty Speaker: At the 2014 USA Science and Engineering Festival, Padhu Seshaiyer will represent GMU as one of the 'Nifty Fifty (times 3)', a group of 150 noted science and engineering professionals who will fan out across the Washington, DC area to speak about their work and careers at various middle and high schools.

STEM Accelerator awarded over \$50,000 in 4-VA grants

The Accelerator program has been awarded over \$50,000 by the 4-VA consortium to create and lead two new initiatives: (a) "Advancing the Mentorship of Academic-Year Governor's School Student Research Across VA: Teacher Professional Development for the 19 VA AYGS at Front Royal" and; (b) "STEM boot camp, Improving access by engaging incoming STEM majors". These initiatives align with the goals of the 4-VA which is a consortium of four universities in the Commonwealth of Virginia that are working together to realize Virginia's goals for higher education.

Select Accomplishments by faculty

Reid Schwebach and Padhu Seshaiyer present sessions at STEM PLUS Career Day at the Walt Whitman Middle School, June 07, 2013.

Julia Nord, Mary Nelson, Katherine Pettigrew and Padhu Seshaiyer participated in the Chesapeake Bay Science Education for New Civic Engagements and Responsibilities (SENCER) Center for Innovation Regional Planning Meeting, Sept 14-15, 2013.

Claudette Davis, Katherine Pettigrew and James Schwebach hosted sessions at the Governor's STEM Summit and High School of the Future StartUp on September 27-28, 2013.

Padhu Seshaiyer presented a session at the STEM Annual Career and Higher Education Day at Fort Belvoir Elem School on Nov 14, 2013.

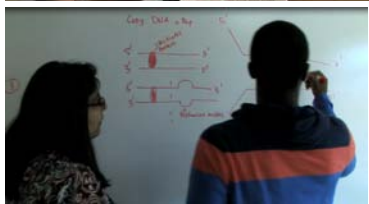
Katherine Pettigrew joined Tom Wood (NCC) on a outdoor experiential learning opportunities for the students of the 5th grade teachers in Fauquier County at Environmental Studies on the Piedmont (Nov 2013).

Julia Nord helped coordinate the 21st Annual Gem Mineral and Fossil Show that attracted 764 adults and 588 children (November 16-18, 2013)

Message from the Director

As Aristotle once said, *"The whole is greater than the sum of its parts."* The COS STEM Accelerator program truly epitomizes this statement with the STEM faculty constantly trying to work together to create new initiatives that will help provide opportunities for excellence, cast a wide net and foster a supportive ecosystem to develop the next generation of STEM innovators. This does not just mean preparing the students on content in STEM and helping them do well in their coursework in STEM but also includes preparing them to become better collaborators, communicators, critical thinkers and creative problem solvers, the four fundamental pillars of twenty-first century skills!

Padhu Seshaiyer



"Wish you a wonderful and Prosperous New year"



**The Accelerator Team
College of Science, GMU**